

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Main report and annexes

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

Map of the Project Area

Federative Republic of Brazil

Planting Climate Resilience in Rural Communities of the Northeast Project (PCRP)

Design report



The designations employed and the presentation of the material in this map do not imply the expression of any opinion whatsoever on the part of IFAD concerning the delimitation of the frontiers or boundaries, or the authorities thereof.

Map compiled by IFAD | 09-06-2020

Abbreviations and Acronyms

AKSAAM	Adapting Knowledge for Sustainable Agriculture and Access To Market
AMS	Agricultural Marketing Services
ANATER	Agência Nacional de Assistência Técnica e Extensão Rural (National Agency for Rural Extension and Technical Assistance)
ANVISA	Agência Nacional de Vigilância Sanitária (National Health Surveillance Agency)
ASAP	Adaptation for Smallholder Agriculture Programme
AWPB	Annual Work Plan and Budget
BNDES	Banco Nacional de Desenvolvimento Econômico e Social (National Bank for Economic and Social Development)
CASM	Collective Areas of Sustainable Management
COFIEIX	Comissão de Financiamentos Externos (Commission of External Financing)
COSOP	Country Strategic Opportunities Programme
CPE	Country Programme Evaluation
CPMU	Central Project Management Unit
CRA	Cotas de Reserva Ambiental (Environmental Reserve Quota)
CRPS	Climate Resilient Productive Systems
DAKI	Dryland Adaptation Knowledge Initiative
EFA	Escola Família Agrícola (Family Agriculture Schools)
EIRR	Economic Internal Rate of Return
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária (Brazilian Agricultural Research Corporation)
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization
FIRR	Financial Internal Rate of Returns
FM	Financial Management
FPIC	Free, Prior and Informed Consent
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHGs	Greenhouse gases
NDC	Nationally Determined Contribution
GIS	Geographic Information System
GoB	Government of Brazil
GTEC	Technical Group
HDI	Human Development Index
I&TP	Indigenous and Traditional Peoples
IACHR	Inter-American Commission on Human Rights
ICP	IFAD Client Portal
IDB	Inter-American Development Bank
INDC	Intended Nationally Determined Contribution
INNOVA	Knowledge Management for Adaptation of Family Farming to Climate Change Programme
INSA	Instituto Nacional do Semiárido (National Semiarid Institute)
IP	Investment Plan

IPCC	Intergovernmental Panel on Climate Change
IPC-IG	International Policy Centre for Inclusive Growth
IPEA	Instituto de Pesquisa Econômica Aplicada (Institute for Applied Economic Research)
IBGE	Brazilian Institute for Geography and Statistics
ISA	Agroforestry System Investments
ISMs	Implementation Support Missions
IT	Information Technology
KM	Knowledge Management
LAC	Latin American and the Caribbean
LF	Logical Framework
LttB	Letter to the Borrower
M&E	Monitoring and Evaluation
MAPA	Ministério da Agricultura, Pecuária e Abastecimento (Ministry of Agriculture and Food Supply)
MAPAINSAN	Mapeamento de Insegurança Alimentar e Nutricional (Food and Nutritional Security Index)
MC	Ministério da Cidadania (Ministry of Citizenship)
MCTIC	Ministério da Ciência, Tecnologia, Inovações e Comunicações (Ministry of Science, Technology, Innovation and Communication)
MDB	Multilateral Development Banks
ME	Ministério da Economia (Ministry of Economy)
M-HDI	Municipal Human Development Index
MI	Ministério da Integração Nacional (Ministry of Integration)
MIP	Monthly Income Plan
MIS	Management Information System
MMA	Ministério do Meio Ambiente (Ministry of Environment)
MTR	Mid-term Review
NDA	National Designated Authority
NDC	Nationally Determined Contribution
NEB	Northeast Brazil
NGOs	Non-Governmental Organizations
NO	No-Objection
NPV	Net Present Values
NUS	Neglected and Underutilized Species
ORMS	Operational Results Management System
OXFAM	Oxford Committee for Famine Relief
PAA	Programa de Aquisição de Alimentos (Food Acquisition Program)
PACs	Political Action Committees
PBAS	Performance Based Allocation System
PCR	Project Completion Report
PCRP	Programa de Combate à Pobreza Rural do Estado da Bahia (Program to Combat Rural Poverty in the State of Bahia)
PDHC	Projeto Dom Hélder Câmara (Dom Hélder Câmara Project)
PGV	Projeto Gente de Valor (Gente de Valor Project)

PIM	Project Implementation Manual
PMEL	Planning, Monitoring Evaluation and Learning System
PNAD	Pesquisa Nacional por Amostra de Domicílios (National Household Sample Survey)
PNAE	Programa Nacional de Alimentação Escolar (National School Feeding Program)
PNATER	Política Nacional de Assistência Técnica e Extensão Rural (National Policy for Technical Assistance and Rural Extension)
PPAs	Project Performance Assessments
PRONAF	Programa Nacional de Fortalecimento da Agricultura Familiar (National Program for Family Farming)
PRO-WEAI	Project-level Women's Empowerment in Agriculture Index
PSI	Programa Semear Internacional
PVSA	Projeto Viva o Semiárido (Viva o Semiárido Project)
RIA/SKD	Research and Impact Assessment Division/ Strategy and Knowledge Department
RL	Reserva Legal (Legal Reserve)
SAI	Supreme Audit Institution
SDG	Sustainable Development Goals
SEA	Sexual Harassment and Sexual Exploitation and Abuse
SECAP	Social, Environmental and Climate Assessment Procedures
SIASI	Sistema de Informação da Atenção à Saúde Indígena (Health Information System for Indigenous Peoples in Brazil)
SIE	Serviço de Inspeção Estadual (State Inspection System)
SIM	Serviço de Inspeção Municipal (Municipal Inspection Systems)
SIF	Serviço de Inspeção Federal (Federal Inspection System)
SISVAN	Sistema de Vigilância Alimentar e Nutricional (National System of Food and Nutrition Surveillance)
SIU	State-Level Implementing Unit
SoE	Statements of Expenditures
SOs	Strategic Objectives
SSTC	South-South and Triangular Cooperation
SUASA	Sistema Unificado de Atenção à Sanidade Agropecuária (System of Attention to Agricultural Health Standards)
TA	Technical Assistance
TDS	Total Dissolved Solids
TOC	Theory of Change
TOR	Terms of Reference
TRIPs	Territorial Resilience Investment Plans
UFV	Universidade Federal de Viçosa (Federal University of Viçosa)
UN	United Nations
UnB	Universidade de Brasília (University of Brasília)
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
WASH	Water, Sanitation and Hygiene
YCs	Young Communicators

In line with IFAD11 mainstreaming commitments, the project has been validated as:

☒ Gender transformational ☒ Youth sensitive ☒ Nutrition sensitive ☒ Climate finance

IFAD Adaptation Finance	\$13,236,000
IFAD Mitigation Finance	\$15,073,000
Total IFAD Climate-focused Finance	\$28,309,000

Executive Summary

1.Context

A.National context and rationale for IFAD involvement

a.National Context

The Northeast Brazil (NEB) is made up of 9 states and has an area of 1.5 million km² and 56.5 million inhabitants. The project will take place within the semi-arid region of NEB, a rural region with a population of 21.3 million people, or 12% of the national population. Over half (59.1%) of Brazilians living in extreme poverty are in the Northeast region. Historically, the area has been the single largest pocket of rural poverty in Latin America hosting 3 million of those living in extreme poverty, of which 46% belong to households in rural areas.

Poverty Context. The semi-arid NEB is still plagued by several social malaises, especially in rural areas where the percentage of the population living in poverty is around 50% in all its nine states. Worst yet, in some states, extreme poverty rates are about 40%. Infant mortality in the rural northeastern states varied between 23 and 33 deaths per thousand births, almost double the national average of 16.7. The illiteracy rate is also striking in the region (ranging from 42% to 32%) when compared to a national average of 9.63%. Among the 27 states in Brazil, in terms of Human Development Index (HDI), three NEB states are in the bottom: Alagoas, Maranhão and Piauí and are considered the poorest in Brazil. All 9 NEB states are among the bottom 15 in terms of HDI.

Rural development context. One key driver of rural livelihood vulnerability in the Northeast is the limited access to water. The region experiences secular chronic water scarcity and periodic droughts. The semi-arid or *Sertão* (its common name in Brazil) is also characterized by a significant imbalance in land ownership (including significant gender inequality in land access, ownership and control), and most impoverished people are smallholding family farmers. Family farms account for over 90% of total farms in the semi-arid drylands of NEB.

Climate Change Context. Family farmers and more specifically poor and extremely poor, are the most affected by climate change. The average crop area lost due to droughts in the 1990-2016 period was 221,973 hectares per year. This is particularly relevant considering that current productivity in the semi-arid is already low; hence, any losses threaten food security in the region, with consequent repercussions on both local and national food security. The drought of 2011–2017, which is considered the worst in the past 100 years, has exacerbated many social problems through the indebtedness of farmers, migration, disease, and malnutrition.

b. Special aspects relating to IFAD's corporate mainstreaming priorities

Climate change. There is a direct correlation between climate change trends, the slow increase in temperatures augmenting human, animals and crop water needs, and increased variability in rainfall patterns, leading to prolonged periods of drought and frequent periods of water scarcity and crop failure. While this affects the entire economy of the NEB, the impacts of climate change are exacerbated for smallholder farmers due to the following sensitivity and adaptive capacity factors: a) high incidence of poverty and dependency on agroecosystem services and low absorption capacity against prolonged droughts and loss of harvest; b) water scarcity and poor water quality (ground and surface water); c) inadequate productive practices that further degrade the soil and its water storage capacity; and d) deforestation of the Caatinga Biome depleting the ecosystem services.

Rural youth. Youth exodus to urban areas intensifies the aging of the rural population as the largest migrant group is the population ranging from 16 to 35 years of age. The Northeast Semi-arid concentrates the majority of Brazilian teenagers living in poverty (67.4%). The Brazilian rural Northeast does not offer enticing employment opportunities, as it combines low income generation capacity, harsh working conditions, and lack of basic services.

Gender. Gender inequality is a deeply pervasive issue across all smallholder production in the NEB. Women and men have different roles in guaranteeing food security and income for their households and communities, resulting in significantly weakened economic empowerment and decision-making capacity for women, and unequal workload distribution. Women are deeply involved in activities within the domestic sphere and subsistence crop production; approximately 46.7% of rural women are involved in subsistence agricultural activities in Brazil compared to 14.0% of rural men. The majority of farmers producing in areas smaller than 5 hectares are women, and 87.3% of women farmers in Brazil do not have access to technical assistance services. Finally, there is an alarming prevalence of gender-based violence in Brazil, which is the result of sexist values deeply rooted in society.

Nutrition. In recent decades, the Brazilian population has undergone major social transformations that have resulted in changes in their standards of health and food consumption. From 1996 to 2007, child stunting in the Northeast of Brazil has dropped from 22.2% to 5.9%. Despite marked reductions in chronic malnutrition, improvements in the nutritional status of the population have not been homogeneous. With the highest rates of poverty in the Northeast region, traditional and indigenous peoples' communities are also more exposed to nutrition vulnerability.

Indigenous and traditional peoples. Indigenous and traditional peoples (I&TP) are particularly vulnerable due to high dependency on natural resources and ecosystem services affected by climate change, marginalization and neglect, and poor access to services including health, education, sanitation, infrastructure and extension services. Extreme poverty affects indigenous people six times more than the rest of the Brazilian population. The infant mortality rates among indigenous children is three times the national average for the first year of life and nine times higher than for children up to 5 years old.

c. Rationale for IFAD involvement

The PCRP will support smallholders in adopting agricultural climate resilient practices (consisting of context-specific methods, arrangements, and technologies) focused on increasing the availability, flow and retention of water in the system. The project will result in resilient and productive farming systems performing restored ecosystem functions, which, in turn, both increase and stabilize family income and food security while incentivizing young generations to stay active in rural activities. This initiative builds upon IFAD's portfolio of investments in NEB.

The project is a partnership between the Government of Brazil (GoB), the National Bank for Economic and Social Development (BNDES), IFAD, and the Green Climate Fund (GCF). It reflects IFAD's strategic orientation to work in Northeast Brazil, the country's rural poverty hotspot, with poor rural producers who are the most affected by climate change. PCRP will focus specifically on empowering the most disadvantaged groups - including women, youth, indigenous and traditional peoples - so they have the capacity to adapt. The project's financing structure capitalizes upon IFAD's accreditation with GCF for both concessional loan and grant resources, channeling climate funds to respond to the needs of the most vulnerable population through IFAD's unique targeting experience and methodology. IFAD also has an Office in Salvador located in NEB to closely supervise projects and engage in dialogue with local stakeholders.

B. Lessons learned

The design of the project benefited from lessons learnt from IFAD's supervision and implementation support missions. It also considered the 2015 Country Programme Evaluation (CPE), the Project Performance Assessments (PPAs) of the Dom Helder Camara Project (PDHC) and the Gente de Valor Project (PGV) undertaken in 2010 and 2015, respectively, and IFAD's Impact Assessment of the PGV carried out by RIA/SKD in 2018/2019 as well as ongoing economic results, surveys and projects evaluations. These documents provided important materials on best practices, lessons learnt and useful experiences, which have been considered during the design.

2. Project Description

A. Project objectives, geographic area of intervention and target groups.

Project Goal and Development Objectives. To reduce the impact of climate change and increase the resilience of the affected population in the semiarid Northeast Brazil. As such, the project will support family farmers and their communities in reversing the decline in productivity caused by the downward cycle of degradation of agroecosystem, adopt technologies for water harvesting, storage and recycling, and diversification strategies to strengthen their resilience capacities.

Expected outcomes. (1) Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions, and (2) Improved dietary patterns, nutrition and food security of households.

Targeting Strategy. The project will implement the following targeting strategy:

- **Geographic area.** The project will be implemented in the Semiarid region of approximately three States of NEB⁴¹. At early project implementation, these will be selected by BNDES with IFAD participation from the nine States of the Northeast based on their borrowing ability from BNDES, poverty characteristics, climate vulnerability, implementation capacity and their commitment to the project.
- The project will directly reach 250,000 smallholder families (approximately 12.5% of family farmers in the NEB) or about one million people. As a criterion for poverty targeting, at least 70% of them need to be registered in the Unified Registry of families with monthly income of up to half a minimum wage per person. At least 40% of beneficiaries receiving project services shall be women and 50% shall be youth (below 29 years), including school children receiving CRPS training in schools. Activities under Component 3 create conditions for scaling up a paradigm shift to the entire Semiarid region, thus potentially reaching indirectly 1.5 million rural families (approximately 6 million persons).
- **Selection of municipalities, communities and beneficiary communities.** State-level implementation units (SIUs) will define subprojects with the **municipalities** using criteria including the environmental precariousness rate (signs of deforestation, erosion, and soil degradation), food and nutritional insecurity rates (malnutrition and chronic degenerative diseases) and tangible effects of drought and level of access to quality water. The subprojects will require the IFAD no-objection.
- Within the participating **municipalities**, SIUs will select the communities and other groups of individual farming families to be involved in the development of Territorial Resilience Investment Plans (TRIPs), involving where present the local traditional and indigenous communities.
- **Gender strategy.** The Project aims to strengthen gender equality and women's empowerment in the semiarid region of Northeast Brazil by transforming social and cultural norms regarding gender roles. As such, it aims to be gender transformative.
- **Youth Strategy.** The main goal of the youth strategy of the PCR is to improve social and economic empowerment of youth in the semiarid of NEB. Three categories of youth will be targeted: (i) young people living in rural areas who have no education or only basic education; (ii) young entrepreneurs; and (iii) school going youth.
- **Nutrition strategy.** To maximize its contribution towards improved nutrition, the project will promote the increasing and diversification of food production with attention to nutrition products, and their consumption at the household level.

B. Components/outcomes and activities

COMPONENT 1. Climate Resilient Productive Systems (CRPS)

This component's main objectives are to implement diversified agroforestry systems that will increase local water availability in the productive system with farmers and communities and, empower them to manage these systems sustainably increasing their food and nutrition security, and promote women and youth leadership. The accumulated GHG mitigation potential of implementation of activities in Component 1 amounts to -6.7 tCO₂e per hectare per year, or about **-11 million tCO₂e over the entire 20-years-period of analysis**.

The State Governments through state-level subprojects will be the implementing agencies for this component.

Through the implementation of CRPS and relevant cross-cutting activities, the project will deliver **Output 1.1. Increase climate resilience for family farmers and traditional communities while mitigating carbon emissions by applying CRPS.**

- **Activity 1.1.1 Selection of Project Areas and development of Territorial Resilience Investment Plans (TRIPs)** This activity will select the project's implementation area. TRIPs will be developed for all selected areas, and will act as "master plans" to guide the project's collective and individual investments in CRPS as well as water harvesting and storage infrastructure.
- **Activity 1.1.2 Implement CRPS in family farms and backyard gardens.** This activity will support groups with household-based productive investments that will increase the resilience to the effects of climate change. The group-based approach will facilitate joint learning and the adoption of technologies and practices to implement CRPS with TA for capacity-building and initial monitoring. It includes productive farming and backyard gardens.
- **Activity 1.1.3. Implement Collective Resilient investments.** With increasing population and land use in the Semiarid, the common areas of the Caatinga are under threat of gradual depletion, mainly due to timber extraction for firewood and overgrazing. The main objective is to improve the ecosystem services in common areas, educate students on how to implement CRPS, and develop pilot testing of productive activities using effluent from the desalination process.
- **Activity 1.1.4 Build a Farmers Network and Promote local entrepreneurship for products and services that support family farming.** To facilitate the replication of CRPS support will be provided by: i) TA teams operating in a territory-based intervention strategy, and ii) small grants and business management support to microenterprises that innovate and produce specific tools and equipment to facilitate the implementation of CRPS. All investments described above will be accompanied by TA teams for 2 years.

COMPONENT 2. Water access for production

The purpose of this component is to disseminate practices in efficient water capture, harvesting, storage and use to decrease vulnerability of livestock and crops to rainfall irregularity and prolonged droughts. All investments in this component will be financed as determined in the TRIPs for beneficiary groups. The State Governments through state-level subprojects will be the implementing agencies for this component.

Through the use of water technologies, the project will deliver **Output 2.1 Improve water access to family farmers and traditional communities to reduce the impact of severe droughts by investing in small-scale technologies for harvesting, reuse, treatment and storage.**

- **Activity 2.1.1. Build boardwalk cisterns for backyard gardens.** This activity will support building of boardwalk cisterns for backyard gardens, small farm ponds and small groundwater storage basins. For rural families, untreated water represents risks to the environment, soil, and human health.
- **Activity 2.1.2. Implement social technologies to increase water in the field** will support building small farm ponds and groundwater storage basins.
- **Activity 2.1.3 Implement treatment and reuse systems for household wastewater.** Only 27% of the NEB population (mostly in urban areas) has access to sewage collection and treatment. Thus, this component will support the implementation of treatment and reuse systems for household wastewater.

COMPONENT 3. Knowledge management and scaling-up

Component 3 supports and expands on the activities in Components 1 and 2. The activities described below will be explored in the project so that information flows serve both to consolidate learning among families who will experience new approaches in CRPS and water access as well as to scale to a regional and international level the adaptation and mitigation measures that the project will propel. **Output 3.1 CRPS and small-scale water harvesting system disseminated in the NEB semiarid and abroad to increase climate resilience of vulnerable communities.**

- **Activity 3.1.1. Raise awareness and build capacities of women, youth and traditional communities.** This activity combines several strategies: i) highlight the leading role of youth and women as 'knowledge managers and generators' and 'local talents'; ii) consolidate laboratories for learning, exchange and replication of sustainable practices in communities through a set of printed and audiovisual materials; iii) facilitate dynamic M&E of socio-environmental impacts, which will be registered in materials that allow effective influence in spaces dedicated to public policy making.
- **Activity 3.1.2. Drive scaling-up, unlock policy barriers and experiment with CRPS and resilience participatory monitoring model.** This activity will promote south-south cooperation; facilitate discussions to unlock policy barriers such as: i) lack of an Environmental Reserve Quota (CRA in Portuguese) market; ii) norms and regulations preventing family farmers

from accessing markets, and iii) gender-based violence; and experiment with CRPS and resilience participatory monitoring model.

- **Activity 3.1.3. Plan, Monitor, Evaluate and Learn (PMEL).** As its main M&E system tool, the project will use the DATA.FIDA Brazil country system currently used by all IFAD-supported projects in Brazil. The system will be customized for BNDES utilization. An independent baseline survey, closing evaluation and mid-term review is part of the project. Activities will take place at national and state level, as follows:

Parts of Activity 3.1.2 (3.1.2.1. Promote south-south cooperation; 3.1.2.2 Facilitate discussions to unlock policy barriers) and part of Activity 3.1.3. (Plan, Monitor, Evaluate and Learn at national level) will be conducted through the Planning, Monitoring, Evaluating, and Learning Unit. The rest of the Component 3 will be implemented by the SIUs.

Project management

Although not a separate component, as per GCF guidelines, management activities are grouped under a separate heading, including the establishment and operation of the SIUs at state-level. As the CPMU will be operated by BNDES in its capacity as project manager and co financier, the operating costs of the CPMU are not included in the project costs.

C.Theory of Change

Current Scenario. Family farmers in the semiarid rely on agriculture for their livelihoods. However, these agricultural systems in the drylands are adversely affected by land pressure and climate change. With reduced productivity, farmers turn to even more intense production methods, which exacerbate degradation of soil and biodiversity, resulting in adverse feedback on climate, food and nutrition security and on-farm income. Current practices place severe strain on limited water resources, making smallholders extremely vulnerable to ever more frequent drought periods. **The PCRPP aims to break this negative feedback loop** transforming family farmers' productive systems in the semiarid NEB by increasing production while simultaneously improving farmers' capacity to face the challenges posed by ongoing climate change.

Our approach: Given the vulnerabilities, climate resilient agriculture for family farmers and I&TP in the Brazilian semiarid translates into practices that increase availability, flow and retention of water in the system. Pragmatically, it means simultaneous implementation practices and principles, denominated Climate Resilient Productive System (CRPS). While the implementation of such practices requires investment and inputs, equally important is the behavioural change that is needed to ensure farmers adopt and embrace new farming techniques. Implementation of CRPS, as proposed under Component 1, will influence hydrological, vegetation and soil conditions across the landscape. Technical Assistance will guide farmers and I&TP communities in the implementation of CRPS, assist families in improving their food and nutrition security and reorganizing social roles and resources governance, strengthen governance of farmers organizations, create networks for farmers to exchange best practices, help access markets, stimulate entrepreneurship and innovation as well as foster active leadership of women and youth. The water access solutions proposed in Component 2, such as rainwater harvest and storage, if accompanied by the current agricultural model, may be temporarily palliative – subject to severe water loss due to high evapotranspiration from heat and wind – but with limited impact in terms of sustainable production in the medium and long term. Water investments in the semiarid must be complemented by soil and vegetation recovery practices promoted in Component 1, to allow infiltration of rainwater, increase soil biomass rate, create shade and wind shelters to reduce evapotranspiration. The first years of the CRPS implementation are the most vulnerable and water harvest and storage systems implemented as a priority during the initial years of the program will increase the availability of water in the system and reduce impacts of droughts, while the system is still fragile. Knowledge management, policy dialogues, communication, and monitoring and evaluation (M&E) activities under Component 3, meanwhile, will allow the investments under Components 1 and 2 to be sustainable and scaled up to other states in the region and dryland areas, including other countries, resulting in the intended gender transformation, nutrition improvement and youth leadership.

Expected outcomes. PCRPP responds to the urgency that climate change projections give to the application of these practices, and recognizes that for them to function effectively as adaptation measures, they must be applied as part of a larger-scale program and be calibrated and adjusted based on the specific needs, priorities and cultural context, both at the regional and family-productive-units levels. The project will result in resilient and productive farming systems performing restored ecosystem functions, which, in turn, both increase and stabilize family income, empower women and youth and improve food and nutrition security.

D.Alignment, ownership and partnerships

Alignment with national priorities and strategies. The project is included in the Brazilian National Strategy for the Green Climate Fund and is aligned with the Brazilian National Policy on Climate Change, Nationally Determined Contribution (NDC), programs to strengthen family agriculture (such as PRONAF), the National Plan for Food and Nutrition Security, the National Policy for the Sustainable Development of Traditional Peoples and Communities, and the Food Purchase Program.

Alignment with IFAD' Strategic Framework 2016-2025 and with IFAD11 mainstreaming agenda. The project is aligned with the Strategic Objectives (SOs) of IFAD's Strategic Framework 2016-2025.

Alignment with Country Strategic Opportunities Programme (COSOP 2016-2021). Project objectives are aligned with the ongoing Results-Based Country Strategic Opportunities Programme (COSOP 2016-2021) for Brazil, which was confirmed in its mid-term review of October 2019. The project contributes to diversify IFAD's institutional partners and explore new co-financing opportunities.

Strategic Partnerships. The project's implementation strategy is based on building partnerships, and in the search for complementarities of experiences, knowledge and other resources, to aggregate value in intervention capacity, scaling up and sustainability. The main partnerships are with BNDES and GCF.

E.Costs, benefits and financing

Project costs

Costs. The total project costs over the eight-year period are estimated at US\$ 217.8 million, including contingencies and taxes. Base costs are estimated at US\$ 212.3 million and both physical and price contingencies represent US\$ 5.5 million (2.5% of total costs). Investment costs are US\$ 204.1 million (94% of total costs) and recurrent costs are estimated at US\$ 13.7 million (6% of total costs). The exchange rate has been established at 4.5 R\$/US\$.

Climate Finance: The total amount of climate finance for this project is estimated at US\$ 28,309,000 or 94.4% of the IFAD investment; of which US\$ 13,236,000 is expected to support adaptation activities, and US\$ 15,073,000 expected to support mitigation specific activities.

b. Project financing/co-financing strategy and plan

IFAD will finance USD 30 million 13.8% of the total Project costs. GCF will finance US\$ 99.5 million (45.6% of total costs) with a loan of US\$ 65 million (29.8%) and a grant US\$ 34.5 million (15.8%). The GCF Funding Proposal has been submitted to the GCF Secretariat and will be presented to the 27th GCF Board (to be held at a date between October and December 2020) for approval.

The national counterpart will be of US\$ 73 million (33.5% of the total cost, including taxes, operative costs and most of staff salaries), in the form of loans from the Brazilian Development Bank (BNDES) to the participating States and from States own budget/resources. Beneficiaries will contribute in kind with US\$ 15.33 million (7% of total costs)..

c. Summary of benefits and economic analysis

Financial Analysis. The financial analysis shows positive Net Present Values (NPV), Financial Internal Rate of Returns going beyond the cutoff rate and Benefit-Costs ratio higher than 1, so all models are considered profitable, with FIRR rates ranging from 10% to 39% depending on the supported activity, and net present values (NPV) at the 10% discount rate varying from R\$ 2,322 to R\$ 219,941.

Economic Analysis. The EIRR is estimated at 19.77% while the NPV reaches US\$ 152 million (R\$ 684 million). The B/C Ratio is 3.18.

Sensitivity Analysis. The project would not be profitable in a case of a mixed cost increase of 20% and a benefit reduction up to 30%. Nine sources of benefits are equally contributing to the total project's additional cash flow. This serves to demonstrate that project benefits are well diversified and not highly exposed to price or sectorial risks.

3. Risks

F. Project risks and mitigation measures

Project risks. Annex 9 presents the Project Integrated Risk Matrix (IPRM) political and governance, macroeconomic and sector strategies and financial management were identified as high risks and mitigative measures have been incorporated into the project.

Implementation readiness: Implementation readiness is not considered a major risk (risks of delayed start-up are considered low). The preparation, during the final design of the project, of the entire selection and contract process of each state by BNDES should considerably reduce the time needed to comply with requirements. In addition, the MIP was prepared and defines several procedures that should make the start more agile.

G. Environment and Social category

The project is classified as **Category B**. The Project has minor to moderate risks of adverse environmental impacts.

H. Climate Risk classification

The project is classified as **"High Climate Risk"**. An analysis of drought events between 1981 and 2016 reveals that drought intensity for the last 36 years has been increasing in NEB.

4. Implementation

I. Organizational Framework

a. Project management and coordination

IFAD. In its role as cofinancier and recipient of GCFs resources, IFAD will be responsible to carry out project supervision, mid-term review and final review missions. IFAD will also be responsible to report to GCF annually on the project's performance. IFAD Office in Salvador will play a critical role in terms of supervision and implementation support.

The Executing Entity (EE). The Brazilian National Development Bank (BNDES) will be the project's Executing Entity and the borrower of the loans. BNDES will operate the domestic sub-lending to the selected states. BNDES is a public development bank wholly-owned by the Federal Government with legal personality incorporated under Brazilian corporate law. BNDES is an organization linked to the Ministry of Economy. BNDES was accredited to the GCF at the Board Meeting held in July 2019. As sole EE, BNDES will have the final decision making power on project activities.

The Central Project Management Unit (CPMU). The CPMU will be housed within BNDES Headquarters (the Executing Agency) to monitor implementation, compile physical and financial information, report to IFAD and be overall accountable for the implementation of the project.

The State-level Implementing Units (SIUs). A SIU will be established for each state-level subproject, which will be responsible for procurement, financial management, evaluation and monitoring of its own activities, including the analyses, corrections and pre-approvals of TRIPs prepared by the TA teams and its submission for validation by the Consultative Councils and submission for final approval for the CPMU.

Planning, Monitoring, Evaluating, and Learning Unit (PMEL): The PMEL Unit will be responsible for the implementation of part of Component 3 in line with the PIM and under guidance from the CPMU. It will be subcontracted by BNDES through a tender process. It will perform financial management, procurement and contract management; and provide full access to and collaboration with the project auditors; submit requests for no-objections to BNDES, for passing on to IFAD; ensure procurement is compatible with the Project's social and environmental safeguards; submits AWPBs, including procurement plans, and physical and financial progress reports for the subprojects to BNDES; ensure that contractors are familiar with GCF, IFAD and BNDES policies, norms and procedures.

Advisory Committee. It will advise the CPMU on the general direction of project execution and promote the integration and alignment with other government projects, programs and policies, as well as the achievement of the project's expected results. It shall be composed of representatives from several agencies of the federal government, civil society, state-level subprojects, BNDES, and NDA.

Consultative Councils. The subproject SIUs will establish consultative councils to ensure attainment of objectives, transparency and equity, which, following the practice of the ongoing IFAD-supported projects, will include the participation of beneficiaries and civil society representatives (including I&TP) in addition to representatives from state secretariats. Its main role will be to review state level AWPBs and evaluate and validate TRIPs.

Legal basis for implementation. The main legal agreements will be the funding activity agreement between the GCF and IFAD; the loan and grant agreement(s) between IFAD and BNDES; and the subsidiary agreements between BNDES and participating state governments.

J.Planning, M&E, Learning, KM and Communication

a.Learning and Knowledge Management

A Planning, Monitoring Evaluation and Learning System (PMEL) will be developed to allow the results-based project management. The data and information collected through the use of specific tools for the implementation of CRPS, will contribute not only to learning, feedback and improvement of project interventions but will also build the foundations for the material relevant to the knowledge management (KM). In addition, the systematization and dissemination of good practices and successful experiences will be important to define and design South-South cooperation schemes, advancing concrete results.

Experiences and best practices of previous and ongoing projects in Brazil will be fully considered in order to enhance learning and KM. In this regard, the Dryland Adaptation Knowledge Initiative (DAKI) grant approved in December 2019 will pave the way for cross-cutting activities in learning and KM, SSTC, policy dialogue and M&E.

b.Innovation and Scaling Up

Innovation. This is the first IFAD project in Brazil that primarily tackles climate adaptation issues. The innovative aspect is the production system proposed and designed to increase water retention in the soil.

Another innovative feature of the project is its governance architecture. Channeling resources through BNDES to the participating states will allow higher levels of efficiency and effectiveness in the implementation of project activities. This mechanism reduces the transaction risk that the fluctuations of the state debt indicators imply to allow direct access to IFAD resources by the states, with the guarantee of the Brazilian federal government. In addition, BNDES is a strategic partner whose commitment and experiences will add value to the entire project cycle and maximize the attainment of project goals. BNDES has national influence and capacity to mobilize resources, disseminate lessons learned to other programs and include CRPS projects in its lending portfolio. BNDES can apply lessons learned from the project to its credit lines to farmers in other Brazilian biomes, enabling replication on national scale. BNDES also has the means to encourage rural entrepreneurs to provide tools and services beyond the Semi-arid, a potential market of over 4 million family farmers (about 16 million beneficiaries).

Scale up. The project will promote knowledge exchanges and young communicator networks inspired by popular education that will propagate successful experiences and foster innovation. Initiatives will be compiled in a database, a web portal and a set of materials that provide good practices for fostering climate resilience throughout the NEB region. The SSTC activities can take the best practices proven in the PCRP to reach other farmers from other drylands in Latin America (e.g., Gran Chaco, Central American Dry Corridor) and Africa. In addition, the project will work on policy dialogues within the states.

1. Context

A. National context and rationale for IFAD involvement

a. National Context

1. The Northeast Brazil (NEB) is made up of 9 states and has an area of 1.6 million km² and 56.5 million inhabitants. The project will take place within the semiarid region of NEB, a region with a population of 21.3 million people, or 12% of the national population. Over half (59.1%) of Brazilians living in extreme poverty are in the Northeast region. Historically, the area has been the single largest pocket of rural poverty in Latin America hosting 3 million of those living in extreme poverty, of which 46% belong to households in rural areas.^[2]
2. The municipal human development index (m-HDI) of the semiarid rural municipalities in the NEB region ranges from 0.443 to 0.710, with an average of 0.587^[3]. Although the indexes have improved over the past 25 years, semiarid NEB is still plagued by several social malaises, especially in rural areas where the percentage of the population living in poverty^[4] is around 50% in all its nine states. Worst yet, in some states, extreme poverty rates are about 40%. Infant mortality in the rural northeastern states varied between 23 and 33 deaths per thousand births in 2010, almost double the national average of 16.7. The illiteracy rate is also striking in the region (ranging from 32% to 42%) when compared to a national average of 9.63%. Among the 27 states in Brazil, in terms of Human Development Index (HDI), three NEB states are in the bottom: Alagoas, Maranhão and Piauí and are considered the poorest in Brazil. All 9 NEB states are among the bottom 15 in terms of HDI (UNDP, 2017). In terms of GDP per capita, among the 27 states in the country, the 9 NEB states are among the bottom states ranked between 17th (Pernambuco) to 27th (Maranhão).
3. A deep economic recession from 2014 to 2017 in Brazil aggravated these factors. The real GDP per capita fell approximately ten percentage points in this period^[5] and unemployment rose from 5.4% in 2014 to 13.7% in 2017^[6]. From 2014 to 2017, poverty increased by 33%, climbing from 8.38% to 11.18% of the Brazilian population^[7]. In addition to the recession, in the same period, the Brazilian government carried out significant spending cuts that had a substantial impact on agricultural subsidies and public policies targeting poor family farmers. The government reduced the budget of major public policies and programmes including the Safra Plan, the National Program for Family Farming (PRONAF)^[8], the National School Feeding Program (PNAE), the Food Acquisition Program (PAA), the National Policy for Technical Assistance and Rural Extension (PNATER), the housing policy *Minha Casa Minha Vida* in rural areas, among others^[9].
4. One key driver of rural livelihood vulnerability in the Northeast is the limited access to water. The region experiences secular chronic water scarcity and periodic droughts. The semiarid or *Sertão* (its common name in Brazil) is also characterized by a significant imbalance in land ownership (including significant gender inequality in land access, ownership and control), and most impoverished people are smallholding family farmers^[10]. Family farms account for over 90%^[11] of total farms in the semiarid drylands of NEB. According to data from the 2006 agricultural census, approximately 2 million family farms employed over 6.5 million people in the Northeast, covering a total of 28 million ha, which accounted for 52% of the value of production and 87% of the total labor in the sector.^[12]
5. Family farms have less than twenty hectares size^[13]. Despite some variants, they generally blend annual rain-fed agriculture harvesting food crops – mainly maize, beans and cassava – for home consumption and sale. Raising ruminants has been the main activity in the Semiarid since colonial times. Rearing goats, sheep and cattle are still the main productive activities for the majority of the region's farms.^[14] Whenever possible, families also have backyard vegetable gardens, a few fruit trees and poultry. In rare cases, there is a small irrigated area.
6. Food crop plots occupy a part of these smallholdings. Forage growing areas are also present, including cultivated pastures and forage production plots, with, for example, fodder cactus (known as *palma forrageira*)^[15]. Generally, the properties also have an area of native vegetation (*Caatinga* biome, which is exclusive to Brazil, and predominant in the semiarid), commonly used as grazing land. The *Caatinga* is also the source of other 'extractive' products, such as fruit, firewood, nuts, etc. Most family establishments suffer from 'water insecurity', characterized by an insufficient capacity to collect and store water reserves.
7. Family farmers and more specifically poor and extremely poor, are the most affected by climate change. The average crop area lost due to droughts in the 1990-2016 period was 221,973 hectares per year.^[16] This is particularly relevant considering that current productivity in the semiarid is already low; hence, any losses threaten food security in the region, with consequent repercussions on both local and national food security. Besides, the expected climate changes may exacerbate other environmental problems that already affect family farming in the semiarid: animal breeding, wild plant gathering, soil degradation, and pests, dissemination of diseases and weeds and desertification.
8. The drought of 2011–2017, which is considered the worst in the past 100 years, has exacerbated many social problems through the indebtedness of farmers, migration, disease, and malnutrition.^[17] The estimated economic losses triggered by seven consecutive years of drought are in the order of \$US 6 billion in the agricultural sector alone.^[18] States reported an annual crop production reduction ranging from 30-75% when compared to the average in the years previous to the drought (2009/2010). In addition to the farmers' income, the prolonged climatic event affected local food markets. Whereas before the drought 80% of beans, 55% of cassava and 52% of maize sold in the Northeast came from local farmers, during the drought their participation fell to 47%, 46% e 16%, respectively.^[19] Animal husbandry also suffered setbacks, losing in 2012 1.3 million bovines, 700,000 sheep, 780,000 goats^[20], and 75% of the bees^[21].

9. The climate change projections of increasing temperatures and irregular rainfall in addition to the current inherent fragile conditions of the soil, the increasingly smaller family units, the constant drive to production intensification and the application of inadequate practices translate into a decline in productivity, of both crops and animal husbandry. Current production practices and systems in the semiarid region are in crisis and feed into environmental degradation processes, which are further aggravated with changing climate conditions. About 13% of the semiarid is undergoing desertification. Drought and extreme climatic events are translated into a decrease in families' productive capacity, particularly striking impoverished families that have already limited capacity. Seeking food and economic survival, households without alternatives are obliged to implement increasingly aggressive land-use practices, accelerating the vicious cycle that accentuates poverty and productive capital degradation.
10. Family farmers in the semiarid region find it hard to sell their products on the market, a fact that discourages investment and innovation. These difficulties may derive from the widely dispersed and reduced scales at which individual farmers work as well as the problem of meeting requirements for marketing products (such as municipal, state or federal legislation) demanding a higher level of organization. In addition, the semiarid is remote and distant from major markets mainly located along the coastal areas.
11. Public health regulations were developed considering agroindustry models and are extremely difficult to implement for small homemade food items, hampering the latter's access to markets.^[22] Many of the products that must comply with stringent health regulation processes (such as jellies, cookies and dairy products) are produced mainly by women following the traditional division of labour with women more actively engaged in processing. National regulation recognizes that food products express cultural identities, revealing traditional know-how, in addition to cultivating a relationship with natural resources and regional biodiversity. Thus, there are multiple reasons to preserve the artisanal characteristics of food.^[23]

b. Special aspects relating to IFAD's corporate mainstreaming priorities

12. **Climate change.** The project is designed to increase the resilience of smallholder farmers in the Brazilian semiarid Northeast by responding to the main climate change threats in the region. As described above, there is a direct correlation between climate change trends, the slow increase in temperatures augmenting human, animals and crop water needs, and increased variability in rainfall patterns, leading to prolonged periods of drought and frequent periods of water scarcity and crop failure. While this affects the entire economy of the NEB, the impacts of climate change are exacerbated for smallholder farmers due to the following sensitivity and adaptive capacity factors: a) high incidence of poverty and dependency on agroecosystem services and low absorption capacity against prolonged droughts and loss of harvest; b) water scarcity and poor water quality (ground and surface water); c) inadequate productive practices that further degrade the soil and its water storage capacity; and d) deforestation of the Caatinga Biome depleting the ecosystem services. Superimposing the increases in temperature, droughts and rainfall variability on the pre-existing socioeconomic vulnerabilities places intense pressure on availability and quality of freshwater in the region, translating into losses of arable land, desertification, increased food and nutrition insecurity, and reduced local economic activities that lower farmers' income and result in rural exodus. These impacts are borne even further by rural women, youth, indigenous and traditional peoples, who are already vulnerable in the prevailing socioeconomic context. As such, the proposed project intervention comprehensively addresses IFAD's mainstreaming themes.
13. **Rural youth.** The Brazilian semiarid northeast is undergoing a demographic transition. Comparing the 2000 and 2010 census data, the proportion of young people in the total population decreased from 33% to 26.5%, while the population over 60 increased from 8.4% to 10.3%. Youth exodus to urban areas intensifies the aging of the rural population as the largest migrant group is the population ranging from 16 to 35 years of age. Brazil's Youth Statute (2013) defines youth as individuals between 15-29 years. One in four Brazilians living in the countryside are considered extremely poor, i.e. 25.5% or 4.1 million people, of which 51% are young people (IBGE, 2010). In the North and Northeast regions, 1.5 million rural young people experience situations of extreme poverty, which is equivalent to 34.9% of all young people living in rural Brazil. In a survey conducted by UNICEF (2014), it was diagnosed that the majority of rural youth in Brazil (45.5%) had not completed elementary school, 37.8% were in high school and 1.6% had reached university.
14. The Northeast Semiarid concentrates the majority of Brazilian teenagers living in poverty - 67.4%. For children and youth, the living, educational and employment conditions are dire. 21.4% of children and teenagers (5 - 17 years old) living in the Northeast region have poor or no access to quality water and sanitation, 25.7% have extreme deprivation of education rights (i.e. are out of school), and 7.3% of are subject to child labour. These conditions lead to the migration patterns described above. The Brazilian rural Northeast does not offer enticing employment opportunities, as it combines low income generation capacity, harsh working conditions, and lack of basic services. Specific youth groups that are even more disadvantaged, include young women, indigenous youth and those from traditional communities. Nevertheless, there is a trend of young family farm members who have received a higher education and return as extension workers and engage in other services, suggesting that a more technical approach to farming and more stable employment conditions may retain youth in the region. The region recently has also been the focus of major foreign investments in renewable energies such as wind and solar power opening new windows of opportunity for youth labour.
15. **Gender.** Gender inequality is a deeply pervasive issue across all smallholder production in the Brazilian Northeast. Women are deeply involved in activities within the domestic sphere and subsistence crop production; approximately 46.7% of rural women are involved in subsistence agricultural activities in Brazil compared to 14.0% of rural men. Women's daily work is made invisible by the fact that most of their transactions and actions are not monetized or calculated, given that they are often not inserted in formal markets. Although women participate in work dynamics within the productive sphere, working in almost all tasks of the property, they are generally excluded from decision making about the use of financial and natural resources, jeopardizing their personal and financial autonomy (SILIPANDRI; CITRÃO, 2011).
16. Furthermore, approximately 30% of households are led by women, with the aggravating fact that 60% of these women do not receive any support from the fathers of their children. These households very often have a higher poverty incidence. The majority

of farmers producing in areas smaller than 5 hectares are women, and 87.3% of women farmers in Brazil do not have access to technical assistance services (OXFAM, 2016). According to *Terrenos da Desigualdade* (2016), of the total number of rural farmers without land, there are almost twice as many women as men. Men presently control 87.3% of rural properties in Brazil and 94.5% of the country's total rural area (OXFAM, 2018). Finally, there is an alarming prevalence of gender-based violence in Brazil, which is the result of sexist values deeply rooted in society ([IACHR, 2019](#)). Young, indigenous and women from traditional communities are often more disadvantaged.

17. **Nutrition.** In recent decades, the Brazilian population has undergone major social transformations that have resulted in changes in their standards of health and food consumption. From 1996 to 2007, child stunting in the Northeast of Brazil has dropped from 22.2% to 5.9% (Demographic Health Survey, 2007). Pro-poor policy initiatives addressed the main underlying causes of malnutrition: inadequate access to food, inadequate care for children and women, insufficient health services and an unhealthy environment.
18. Despite marked reductions in chronic malnutrition, improvements in the nutritional status of the population have not been homogeneous. With the highest rates of poverty in the Northeast region, traditional and indigenous peoples' communities are also more exposed to nutrition vulnerability. As recent research from the Ministry of Health has shown, stunting in children under five still affected 9.8% of indigenous children in the Northeast in 2017 (SIASI, 2017), wasting 2%, while 16% experienced overweight and obesity. In general, there has been a step increase in overweight and obesity in all sectors of the population, directly related with changes in eating patterns and increased consumption of ultra-processed foods, which are often the most affordable in markets. The double burden of malnutrition (the coexistence of overnutrition alongside undernutrition) is mostly affecting the poorest communities: data (SIASI, 2017) show that the Northeast is the region with the highest number of overweight indigenous children in Brazil, while quilombola population has the worst morbidity profiles in relation to obesity and malnutrition in the country.
19. In this context, the correlation between poverty rates, environmental constraints and food and nutrition insecurity is clear. Severe and recurrent droughts and the scarcity of water are also threatening food and nutrition security of family farmers already living in poverty. Climate change is further exacerbating existing environmental problems (disruptions of water flows and poor quality of water sources, salinization of the soils, dissemination of pests and diseases) directly affecting the health status of the rural population.
20. **Indigenous and traditional peoples.** Indigenous and traditional peoples (I&TP) are particularly vulnerable due to high dependency on natural resources and ecosystem services affected by climate change, marginalization and neglect, and poor access to services including health, education, sanitation, infrastructure and extension services. The approximate number of families of I&TP in NEB are as follows: Quilombolas (80,371), artisanal fisherfolks (48,379), indigenous (32,715), agrarian reform settlers (28,868), ribeirinhos or riverside communities (9,382), extrativistas (non- timber products gatherers) (6,786), and others with significant smaller numbers. ^[24] Around 40% of the indigenous communities in NEB are located in the semiarid, mostly in Bahia, Pernambuco and Maranhão. ^[25] Only 0.42% of the *caatinga* is demarcated as Indigenous territory, and the lands are usually small in size, some less than 100 hectares. ^[26] There are 1181 registered quilombola communities in the NEB semiarid, that are home to between two to fifteen thousand families. Another relevant traditional community are the Fundo de Pasto, of which 476 communities are registered in the Bahia state, though an estimated 700-1,000 fundo de pasto communities that do not have land titles.
21. Extreme poverty affects indigenous people six times more than the rest of the Brazilian population (UNICEF). The infant mortality rates among indigenous children is three times the national average for the first year of life and nine times higher than for children up to 5 years old. A study with Quilombolas found that 69% communities lacked any type of public transportation, garbage was not collected in 71% of households, almost half of them (45.8%) had open sewage, 35.9% of communities were short of treated water and 15% of children with less than 5 years old had short stature for their age, expressing severe malnutrition (*Chamada Nutricional Quilombola*, 2006). One of the most obvious forms of exclusion affecting I&TP, in particular those living in rural areas, has been the statistical invisibility they have been subject to. The disaggregation of data by sex, race, ethnicity and region constitutes a fundamental tool for designing public policies, but is still not available Brazil. The nutrition and public services data for indigenous and quilombolas presented in this paragraph are for all of Brazil but should be more severe in the semiarid NEB.

c. Rationale for IFAD involvement

22. PCRP aims to increase resilience of family farmers by addressing the root causes of unsustainable productive practices and lack of access to water in the Brazilian semiarid. The dryland ecosystem in NEB has been subject to long-term degradation of its ecological and productive function due to rising demographic and farming pressures on the limited resources available. An analysis of prevailing agricultural systems shows that many current practices increase vulnerability, threatening the livelihoods of families that depend on these farming systems. In this context, water accessibility is the critical factor, as water scarcity often results in partial or total loss of harvest. Climate change exacerbates this scenario, as greater rainfall variability, more severe and frequent droughts, and higher temperatures aggravate the downward cycle. This results in a decline in productivity that feeds into social and environmental degradation processes and induces the impoverishment of family farmers and ecosystem services. The recent 2011-2017 drought (the worst in the past 100 years) offered a glimpse of a future in which the possible collapse of smallholder farming systems increases food and water insecurity, causing an acute crisis affecting the livelihood itself of semiarid communities in Northeast Brazil.
23. To address this threat, there is an urgent need for sweeping changes in the stewardship of semiarid agriculture systems in NEB, working with vulnerable smallholder communities to adapt to predicted future conditions and become more resilient. The project will support smallholders in adopting agricultural climate resilient practices (consisting of context-specific methods, arrangements, and technologies) focused on increasing the availability, flow and retention of water in the system. The project will result in resilient and productive farming systems performing restored ecosystem functions, which, in turn, both increase and

stabilize family income and food security, while incentivizing young generations to stay active in rural enterprises. This initiative builds upon IFAD's portfolio of investments in NEB, reinforcing sustainable production elements in the face of climate change and linking with existing production, processing, and marketing capacities supported by other IFAD and non-IFAD projects to increase smallholder resilience.

24. The project is a partnership between the Government of Brazil (GoB), the National Bank for Economic and Social Development (BNDES), IFAD and the Green Climate Fund (GCF). It reflects IFAD's strategic orientation to work in Northeast Brazil, the country's rural poverty hotspot, with poor rural producers who are the most affected by climate change. The design applies IFAD's people-centred approach to development financing, which is central to induce a change in the behavioural pattern of the rural population building their resilience capacities. PCRFP will focus specifically on empowering the most disadvantaged groups - including women, youth, indigenous and traditional peoples - so they have the capacity to adapt. The project's financing structure capitalises upon IFAD's accreditation with GCF for both concessional loan and grant resources, channelling climate funds to respond to the needs of the most vulnerable population through IFAD's unique targeting experience and methodology. Likewise, the project enhances BNDES's capacity to engage with smallholders in NEB in its investment program, providing concessional financing through a blend of funds to federal state governments. IFAD's unique capacity for project supervision and implementation support is fully recognized by all project partners with over 30 years of experience in project operations with states in NEB. IFAD also has an office in Salvador, in the State of Bahia, to closely supervise projects and engage in dialogue with local stakeholders.
25. The partnership with BNDES develops a new operational model for IFAD in Brazil, paving the way for additional joint opportunities and potential upscaling of project interventions. BNDES has engaged with IFAD in the preparation and review of the Results-Based Country Opportunities Programme (COSOP 2016-2021). BNDES has also participated in a number of IFAD project design and supervision missions. The Federal Government of Brazil is fully committed to IFAD's central role in developing this initiative in partnership with BNDES and it has included this project as a priority in its national pipeline for GCF funding, providing a No-Objection (NO) letter from the GCF's National Designated Authority (NDA) upon consultation with all relevant Federal Government agencies. The issuance of the NO letter from the NDA followed an intense consultation process which involved major federal partners including the Ministry of Economy (ME), Ministry of Citizenship (MC), Ministry of Environment (MMA), Ministry of Agriculture, Food Supply (MAPA), Ministry of Science, Technology, Innovation and Communication (MCTIC), and Ministry of Integration (MI). A formal request (*Carta Consulta*) was approved by the Commission of External Financing (COFIEF) of the Ministry of Economy, approving the project and authorizing BNDES to go through the process leading to formally request the sovereign guarantee for the project.
26. All nine States governments of NEB were consulted through specific state visits and through the Forum of State Secretaries of Northeast Brazil and the Consortium of Northeast Governors (*Consórcio Nordeste*), both of which IFAD has strong links with. In addition, a public consultation with over 120 representatives from civil society and farmers' organizations was conducted, as well as a dedicated public hearing with indigenous communities.
27. IFAD is a suitable agency for leading the development, supervision and implementation support of this project. It was requested by federal and state governments to support the project, for several reasons including the following:
 - (i) The project's flow-of-funds structure capitalises upon IFAD's accreditation with GCF for both loan and grant funds, its experience with climate finance through the ASAP fund and its capacity to administer project financing;
 - (ii) The project reflects IFAD's strategic orientation to work in Northeast Brazil as the country's rural poverty hotspot, and with poor rural producers and their organisations, who are the population the most affected by climate change in that part of the country;
 - (iii) The project also applies IFAD's people-centred approach to development financing, which is central to a climate response that requires a change in the behavioural pattern of the rural population;
 - (iv) The project design integrates IFAD's targeting experience in focusing support on the most exposed population in cases of climate stress, especially drought;
 - (v) The project investments build upon IFAD's experience in supporting sustainable and climate-smart production systems in Northeast Brazil, exploit IFAD's knowledge base of applied sustainable solutions in the semiarid areas of LAC, and are complementary to IFAD's investments in farmer groups' productive and marketing capacities;
 - (vi) The project capitalises on IFAD's strong engagement with local and regional actors in the Northeast including state governments, civil society and others;
 - (vii) Lastly, by virtue of its strong track record and experience in project supervision and implementation support, IFAD is well placed to guide the implementation of the project with regular missions that analyse its progress and propose solutions to emerging challenges, in collaboration with the implementers. Its office in Salvador is strategically located in order to continue providing strong supervision.

B. Lessons learned

28. The design of the project benefited from lessons learnt from IFAD's supervision and implementation support activities. It also includes lessons from the 2015 Country Programme Evaluation (CPE); the Project Performance Assessments (PPAs) of the Dom Helder Camara Project (PDHC) and the Gente de Valor Project (PGV) undertaken in 2010 and 2015, respectively; and IFAD's Impact Assessment of the PGV carried out by RIA/SKD in 2018/2019, as well as ongoing economic results, surveys and projects evaluations. These documents provided important materials on best practices, lessons learnt and useful experiences, which have been considered during the design, as presented in the summary table below.

Lesson Learnt	How the lesson has been incorporated in the design
<p><u>State debt rating fluctuations.</u> To receive federal loan guarantee, states need to achieve a minimum rating based on their debt and fiscal capacity assessed by the Ministry of Economy. This poses a high risk to IFAD, as the rating can change every year or even more frequently. It may even change for a project after the design stage, for instance, during the period waiting for signature.</p>	<p>The PCRPs innovative multi-state approach of lending to BNDES for on-lending to the participating states provides greater stability and minimizes debt rating risks. It also means that, through a single loan operation, IFAD will reach several states. BNDES provides on-lending to states based on an assessment of debt and fiscal capacity. IFAD will also count on BNDES solid expertise in lending high volumes of financing and undertaking many state-level operations in Brazil. In addition, BNDES has vast experience in monitoring and implementing loans in Brazil.</p>
<p><u>Productivity focus and climate resiliency issues.</u> IFAD projects seek to increase and diversify production, with strong targeting mechanisms for poverty reduction. However, climate resilience aspects are often considered secondary or appear late in project implementation. The 2019 Impact Assessment of the PGV recommended that IFAD include training in off-farm work opportunities that are relevant to the rural context to minimize drought risks. Projects have also incorporated significant non-agricultural intervention (lacemaking, handicraft and rural tourism, which benefit women and youth primarily). To prepare for increasing climate variability, it is recommended that future project designs consider a diversified investment plan, including water access and non-agricultural activities. Focusing on agricultural interventions may not be sufficient to reduce rural poverty or the reliance on government support programs.</p> <p>During the 2011-2017 drought that severely affected Northeast Brazil, the IFAD-supported projects had to reorient their interventions by transferring resources to water access programmes, for which they were not designed. This allowed IFAD to accumulate experience on water access activities and also served as a strong signal to lay the ground for future climate resilient interventions. The resulting best practices on water access should be combined with productive interventions to respond to climate-resilient adaptation requirements.</p>	<p>The PCRPs was designed to assist farmers in adapting to climate change impacts. It considers the increased demand for water and will assist farmers in the implementation of climate resilient productive systems (CRPS) that increase water availability in the system as well as water harvesting and storage units. It represents a major shift for IFAD's operations in Brazil, as it simultaneously responds to two major demands from family farmers in NEB. The PCRPs presents a structured long-term approach, whilst capitalizing upon existing interventions. IFAD's experience in small-scale water harvesting and storage systems for production was incorporated in the design, such as the grey water reuse (bioágua familiar) and drip irrigation with solar power – all (tested and up-scaled in other projects). Predominantly managed by women, these innovations have allowed significant production diversification of vegetables, fruits, medicinal plants and fodder that have a direct impact on household nutrition and food security. Other water harvesting and storage technologies proposed in the PCRPs have been tested by the ongoing project at a limited scale. The most adequate and effective ones were selected for the PCRPs, including boardwalk cisterns, small farm ponds, underground water storage and green septic systems.</p>
<p><u>Organizational strengthening and TA services:</u> IFAD has vast experience in establishing and strengthening community organizations, associations and cooperatives to ensure interventions are carried out locally and sustainably. Hundreds of small farmers associations have been trained in basic accounting, financial management, governance and procurement practices by Technical Assistance (TA) services. However, the 2019 Impact Assessment of the PGV highlighted the need to increase efforts to strengthen marketing and an appropriate Exit Strategy for TA services. There is also the risk of TA service providers driving community selection to consolidate their services and work with associations already mobilized to receive resources. There is a risk of TA services not going far enough, with associations and cooperatives lacking experience along the supply chain.</p>	<p>The focus on organizational strengthening with TA services has proven successful and has been scaled by other projects in Brazil. This will be replicated and reinforced in the PCRPs. The Territorial Resilience Investment Plans (TRIPs) will serve to guide investments for a specific area. If the PCRPs is implemented in States with previous IFAD projects; it can build on organizations that have been strengthened by those projects.</p> <p>The ongoing PDHC phase II will serve as an important base for the project, as it is one of the major supporters of the National Agency for Rural Extension and Technical Assistance (ANATER), which will be central for the project's Exit Strategy.</p> <p>A rigorous diagnosis will be developed once the state is selected to identify the most vulnerable population. The PCRPs targeting mechanisms and criteria will be applied by TA teams for beneficiary and community selection to avoid elite-capture. The PCRPs territorial approach (through TRIPs methodology), working with groups of 4 communities in each territory, will also serve as an instrument to ensure beneficiary integration and participation.</p>

<p><u>Community organizations and investments feasibility and sustainability.</u> According to the 2015 CPE, project support to large economic organisations such as processing units didn't devote enough time to marketing support, thus limiting the income generation and operating capacity of the organisations. This does not apply to small community-based activities, whose products target the local or institutional markets. At the same time, training provided to community organizations could also reinforce marketing and group development. For large investments, a clear exit strategy, including an analysis of the business case long-term rate of return and requirements for economic profitability and break-even point should be strengthened.</p>	<p>The PCRPP will focus on community organizations and associations. No large processing units are expected to be constructed. When working with larger cooperatives or associations, the focus will be on diversifying production and implementing CRPS. This will open new possibilities to access markets, which will be explored by the TA teams.</p> <p>The PCRPP also adopts a simplified methodology to prepare investment plans developed by IFAD in 2016. This methodology streamlines the design process, increases quality, includes a full economic and financial analysis, and standardizes outcomes – whether promoting a healthier diet for the families or an increasing income. Application of this methodology made it possible to plan and appraise plans rapidly and with a solid level of economic and financial feasibility. This methodology will be used by all TA teams.</p>
<p>The 2015 CPE recommended that projects devote more attention to smallholder agricultural activities. This would include <u>priority to production and productivity enhancements</u> through investments in adaptive research and extension to address climate change issues; water resource management and irrigation development; among other agricultural related aspects.</p>	<p>The project design and theory of change focus on smallholder farmers to adapt to prolonged droughts by implementing CRPS (Component 1) while improving short term water harvesting and storage (Component 2). It also includes extensive technical assistance (2-3 years), as well as farmers networks to exchange experiences and young communicators network to disseminate the information across the region.</p>
<p><u>Social inclusion.</u> The 2015 CPE noted that gender and, more broadly, targeting issues have been addressed in a comprehensive manner. However, it noted that there is scope to enhance the participation of women and other groups such as youth and Quilombola communities in developing the community or investment plans. A number of good practices have been identified.</p>	<p>PCRPP will build on good practices from the IFAD portfolio in Brazil (e.g. women's leadership, promotion of backyard gardens, use of young women as development agents, reducing women's workload through labour and time-saving technologies, "agroecological booklet" to account for women economic and financial contributions, among others). Special attention will be devoted ensuring women and youth have a prominent role in the development of the TRIPs.</p>
<p>More emphasis on knowledge management (KM), policy dialogue, south-south and triangular cooperation (SSTC), policy dialogue and monitoring and evaluation (M&E) was recommended in the 2015 CPE and PPA. This includes the <u>systematization, analysis of information, innovations</u> as well as on overcoming constraints in scaling up, dissemination and contribution to public policies and programmes. Moreover, there is a need for a better balance between lending and non-lending activities, including enhanced policy dialogue with federal agencies for scaling up impact and knowledge sharing.</p>	<p>Component 3 focuses on KM, including SSTC, M&E and policy dialogue. The SSTC and KM will be centrally managed by BNDES to ensure coherence. The successful experience and work of the Programa Semear Internacional (PSI) (a KM grant project in Brazil), was considered during design. In addition, an expanded portfolio of grants under the Brazil hub supervision - PSI, AKSAAM, INNOVA and DAKI - will enhance KM and SSTC activities beyond the PCRPP.</p> <p>The project will share field experiences with the Forum of State Secretaries for Family Farming of the Northeast and the Consortium of the Northeast Governors, which can leverage new financing modalities for family farmers. The Consortium and the State Forum will continue to play a major role in policy dialogue platforms for family agriculture in Northeast Brazil and will remain important for the policy dialogue strategy of the PCRPP.</p> <p>Concerning M&E, IFAD has launched DATA.FIDA, which is an update and upgrade to the country-based M&E system and which will be adapted for and used by the PCRPP.</p>

<p><u>Delays in project start-up leave little time for the consolidation of project activities.</u> The CPE and PPA found that the consolidation of activities is difficult given the nature of IFAD interventions: high number of beneficiaries in vast areas, rigorous targeting and comprehensive participatory planning and implementation processes. Project start-up often takes more than three years (a major bottleneck has been the process to contract TA service providers) and develop the economic and social baseline of all communities based on a full participatory process, leaving insufficient time to implement productive activities. Given the demand-driven approach, communities only prioritized market-oriented activities in the final years of the projects leaving little time for the consolidation.</p>	<p>The PCRPP incorporates lessons learnt from projects start-up. To facilitate the contracting of TA service providers, draft terms of reference (TOR) have been prepared. Participatory planning mechanisms will be guided so that they are carried out in a focused manner. The PCRPP approach to implement TRIPs is an innovation that was implemented in IFAD's project in Bahia, which will facilitate implementation. The Project Implementation Manual (PIM) was developed and will be a key instrument to ensure implementation readiness. In addition, IFAD grant projects will contribute to PCRPP's implementation readiness, in particular the DAKI, which will build capacity amongst extension TA service providers in CRPS, and the DATA.FIDA programme for project M&E developed by PSI will facilitate community profiling.</p>
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2. Project Description

C. Project objectives, geographic area of intervention and target groups

29. Severe and recurrent droughts are threatening food and nutrition security of family farmers in the Northeast semi-arid region. Climate change exacerbates accessibility to water and other existing environmental problems (pests, dissemination of diseases) directly affecting poverty and extreme poverty in the rural population. The lack of nutritional knowledge affects food choices, which result in poor dietary intake. Women's social status and limited control over household's resources affect their nutritional status and their children's.
30. **The objective of the project** is to reduce the impact of climate change and increase the resilience of the affected population in the semiarid Northeast Brazil. As such, the project will support family farmers and their communities in reversing the decline in productivity caused by the downward cycle of degradation of agroecosystem; adopt technologies for water harvesting, storage and recycling; and diversification strategies to strengthen their resilience capacities.
31. The partnership between IFAD, GCF, GoB, and BNDES will facilitate a shift from the predominant current paradigm to one characterized by a productive system capable of increasing water retention and other ecosystem services (CRPS), farmer-led technology development, and active leadership from women and youth. PCRPP will work with existing supply chains in each territory, increasing productivity and strengthening resilience, capitalizing existing infrastructure and processing units.
32. Project objectives are aligned with the ongoing Country Strategic Opportunities Programme (COSOP 2016-2021) for Brazil. Strategic Objective 1 (Increase production and resilience to climate change) is supported in Component 1, which will implement climate resilient productive systems for poor family farmers. Strategic Objective 2 (Access to public policies and capacity building) is in line with Component 2 of building capacity and community organization as well as water access. All three components will contribute to Strategic Objective 3 (Scaling up good practices) through entrepreneurship, farmers groups, south-south and triangular cooperation (SSTC), young communicators network, as well as the M&E and MK activities. The partnership with BNDES is also a means to scale good practices implemented in the project. In addition, PCRPP contributes to diversify IFAD's institutional partners and explore new co-financing opportunities.
33. The project will contribute to IFAD's strategic objective 1 (increased production) through improved access to and management of natural resources and adoption of improved farming practices, and strategic objective 3 (greater resilience) through adoption of climate resilient production systems, increased access to water resources, and livelihood diversification.

Geographical targeting

34. **Geographic area.** The project will be implemented in the Semiarid region of approximately three States of Northeast Brazil (NEB)^[27]. As all 9 NEB states rank amongst the poorest states in Brazil in terms of UNDP's HDI or GDP per capita, they would all qualify against poverty criteria. As such, at early project implementation, the participating states' eligibility will be determined based on their ability to borrow domestically from BNDES, i.e. the state's fiscal space for the borrowing. The application of fiscal space during project implementation is innovative in that it provides flexibility in responding to the situation at the time of defining the subsidiary financing agreement with the states (thus avoiding the risks of cancellation due to fiscal downgrades). This responds to requests from the Ministry of Economy, and reflects the national financing procedures applied by BNDES.
35. **Selection of states.** Each eligible state will be invited to present a state-level subproject proposal to BNDES as the Executing Entity of the PCRPP. The proposal shall include geographical targeting of municipalities and communities, priority activities and key targets to be achieved. The project area and mix of activities would require to be fully aligned with the project's targeting criteria, intervention approach and proportional balance of activities, the Logical Framework indicators and the Project Implementation Manual (PIM). The proposal shall also include project governance and management arrangements and compliance with applicable legislation. The final selection of the approximately three states will be based on a ranking of the eligible proposals according to the following criteria: i) verification of borrowing capacity; ii) state qualification (experience in similar projects, such as IFAD-financed ones); iii) counterpart financing capacity; iv) incidence of rural poverty; v) climate vulnerability index and historical exposure to drought; vi) food and nutritional security index; and vii) water quality and availability. After application of

these criteria, approximately three NEB states will be pre-selected as eligible to present a state-level Consultation Letter (Carta Consulta) to BNDES. This document will undergo further analysis by the BNDES technical team before it is submitted for final approval to the BNDES Board of Directors.

36. **Selection of municipalities.** Based on the subproject proposals from the selected states, the selection of municipalities within the states for project interventions will be based on their ranking using the following variables and instruments: i) Incidence of rural poverty; ii) Climate vulnerability index and historical exposure to drought; iii) Food and nutritional security index; iv) Water quality and availability; v) Presence of schools capable of receiving the Project's actions; vi) Presence of other relevant projects or programs that can contribute to strengthen project activities; and vii) Contiguity (or at least proximity to each other) of municipalities for effective and efficient implementation; and viii) Presence of collective areas. More details are included in Annex 8 (PIM). ^[28]

Target groups and strategies

37. The NEB has a rural population of approximately 9 million people (2017). Approximately 6.5 million people work on 2 million rural family farms constituting 90% of farms in NEB and producing 52% of the value of production in the agricultural sector (2006). Many of these farmers, their labourers and their families are poor or extremely poor, constituting the majority of the 1.38 million people living in extremely poor rural households in the NEB. The project will directly reach 250,000 family farmers and their families (approximately 12.5% of family farmers in the NEB) or about one million people. The main selection criteria for accessing the project services will be poverty levels. As an eligibility criterion, at least 70% of beneficiaries in each participating community shall registered in the Cadastro Único (CadÚnico) or Unified Registry^[29] of families, for which they may dispose of a monthly income of up to half a minimum wage per person. At least 40% of beneficiaries receiving project services shall be women and 50% shall be youth (below 29 years) including school children targeted through CRPS training in schools. Activities under Component 3 create conditions for scaling up a paradigm shift to the entire Semiarid region, thus potentially reaching indirectly 1.5 million rural families (approximately 6 million persons).
38. The family farming^[30] segment includes Quilombolas, Ribeirinhos and Fundos de Pasto traditional communities, indigenous people communities, agrarian reform settlers, and other family farmers practicing crop farming and livestock rearing (including beekeeping), artisanal fisheries, aquaculture, pisciculture, and harvesting of non-timber forest products. Within these groups indigenous and traditional communities are particularly vulnerable due to high dependency on natural resources and ecosystem services affected by climate change, with direct impact on their food and nutrition security, marginalization and neglect, and poor access to services including health, education and extension services, and lack of land titling or official recognition as a traditional group. They are also different from the other individual family farmers in the NEB in that they have common management of land.
39. Based on these considerations in addition to women and youth as cross cutting subtarget groups, the following three subgroups have been defined:

Individual smallholder family farmers. This will be the largest target subgroup because of their high numbers and levels of poverty in rural areas in NEB. They produce on individual farms on less than 20 hectares of land, many without secure land titles. The majority of them are poor or vulnerable to poverty, some are extremely poor and a few are living sustainably above the poverty line. They cultivate mostly in mixed crop-livestock systems in individual farms for their own family consumption and selling of surplus with some participation in value addition processing activities seeking to improve their market access, which is mainly local. Some of them use communal or public areas for grazing, but with no tradition for joint management of resources in these areas prone to degradation. Their main production constraint is their limited access to water to cope with the increasing frequency of droughts. They also have little access to tailored technical assistance that can support them in understanding climate change risks and related vulnerabilities of their farming systems and options for diversifying and enriching soil, water and vegetation management practices to optimize the recycling and efficiency in the use of resources and increase their resilience.

Based on information campaigns and encouragement, eligible farmers (households below or just above the poverty line) in the selected municipalities will be self-targeting for participation in project activities. The project will primarily work with them in improving their individual farms through the adoption of CRPS in their farms and backyard gardens. They will also be supported in simple technologies for water harvesting and storage in cistern, treatment of household grey and black water and reuse for backyard fruit trees and vegetable gardening. For group-based activities (development of Territorial Resilience Investment Plan (TRIP), training and farmer-to-farmer learning networks), up to 30% of the participating farmers living and producing in the landscapes covered by the TRIP can be non-poor. They are important users of the landscapes and need to be included in change processes. They could be important reference farmers serving as disseminators of experiences and models.

Traditional communities. The second largest subgroup targeted will be the traditional communities. The traditional communities includes 80,371 Quilombolas families, 28,868 agrarian reform settlers families, 9,382 ribeirinhos families, 6,786 extrativistas (non-timber products gatherer) families and others smaller groups. The rate of extreme poverty are higher and different human development indicators are lower in these communities compared to the general rural population in the NEB (more than 25% of Quilombola families live in extreme poverty, only 36.2% percent of their communities have running water, and 87.3% of heads of family have not completed primary education). This is due to historical neglect by government programs and services and their limited linkage to markets and access to opportunities such as quality jobs. These communities manage and use common land for grazing, hunting and gathering activities and individual land for family crop farming, however often with weak land tenure security. In particular, the Fundo de Pasto communities suffer from encroachment of their mutually managed grazing land and little understanding by government programmes on their way of life, where common land titling is more relevant than the individual land titles supported by the states. Because of their high livelihood dependence on natural resources and ecosystem services, traditional communities are highly vulnerable to the climate change related shocks and stresses that interrupt the productivity and functioning of their ecosystems. Even though they have historical traditions and knowledge on managing their land and natural resources, they have little access to tailored technical assistance that can support them in understanding climate change risks, their livelihood vulnerabilities and adaptation options including changes in their production and natural resources management practices and livelihood diversification. Traditional communities will be directly targeted when present in the selected municipalities proactively informing them about the

project and consulting them about their initial interest in participation. As a first activity the project will discuss and agree with each community on the Free Prior and Informed Consent (FPIC) process to be followed in the development of a TRIP. The TRIP will cover several neighbouring communities sharing landscapes and resources. Participatory approaches ensuring gender, age and wealth group representation will be used to obtain broad consent on the TRIP defining the activities that will be implemented with each community and how participants will be targeted and selected.^[31] Priority activities targeted to these communities are Collective Areas Sustainable Management (CASM), water harvesting for household and productive needs and water recycling for vegetable and fruit gardens in particular for women, and capacity building for women (women's rights, agroecology, and nutrition). Youth from the communities will also be proactively targeted with specific activities described in the youth strategy and by providing them with extra support in literacy as needed.

Indigenous Peoples communities. The smallest target subgroup will be the indigenous communities constituting a smaller ethnic group in the rural population. There are an estimated 32,715 indigenous families in the NEB; about 40% of them live in the semiarid and mostly concentrated in the states of Bahia, Maranhão and Pernambuco. They have many similarities in their needs with traditional communities. They have even higher rates of extreme poverty and lower human development indicators. This is due to neglect by government programs and services, malnutrition and hunger. They have very limited access to markets and quality jobs. They manage and use common land for grazing, hunting and gathering activities and crop farming. The Caatinga is the biome with the least protected areas and very few indigenous lands, mostly of small size. Because of their high livelihood dependence on natural resources and ecosystem services, they are highly vulnerable to the climate change related shocks and stresses that interrupt the productivity and functioning of their ecosystems. They have historical traditions and knowledge on managing their land and natural resources, but they have little access to tailored technical assistance that can support them in understanding climate change risks, their livelihood vulnerabilities and adaptation options including changes in their production and natural resources management practices and livelihood diversification.

When present in the selected states, they will be directly targeted as communities, proactively informing them about the project and consulting them about their initial interest in participation. As in the case of the traditional communities, as a first activity, the project will discuss and agree with each community on the FPIC process to be followed in the development of their TRIP covering several neighboring communities. Participatory approaches ensuring gender age and wealth group representation will be used to obtain broad consent on the TRIP defining the activities that will be implemented with each community and how participants will be targeted and selected. Priority activities targeted to these communities are Collective Areas Sustainable Management (CASM), water harvesting for household and productive needs and water recycling for vegetable and fruit gardens in particular for women and capacity building for women (women's rights, agroecology, food and nutritional security). Youth from the communities will also proactively be targeted with specific activities described in the youth strategy and by providing them with extra support in literacy as needed.

40. All professionals who will be providing technical services under the project will attend sensitivity training in gender, race and ethnicity, with a focus on methodological approaches and instruments that ensure compliance with the FPIC process and consider each community's way of life, and the relationship they have with natural resources and their land governance and management practices.
41. **Select beneficiary communities and groups.** Within the priority municipalities, SIUs will define the areas with traditional and indigenous communities and other groups of individual farming families to be involved in the development of a TRIP always having the poverty incidence as the main eligibility criterion based on at least 70% of beneficiaries in a community in extreme poverty or poverty, based on registration in CadÚnico. Within the poverty group, the following vulnerability criteria will be used: i) the environmental precariousness rate (signs of deforestation, erosion, and soil degradation); ii) food and nutritional insecurity rates (malnutrition and chronic degenerative diseases); and iii) tangible effects of drought and level of access to quality water. Additional criteria will be utilized to complement the selection as per item 6.5 of the PIM (Annex 8). A baseline survey will be conducted to collect information on agricultural production, herds, local climate, water availability, gender issues, resilience capacities (using the resilience index developed for the PCRP), food security and nutrition. The survey will support the prioritization of activities and investments in the TRIPs and the targeting of those with the greatest climatic, socioeconomic and environmental vulnerability within the areas covered by the TRIPs. Within each community or group, the project will work with families who are at greatest risk of being pushed into conditions of food insecurity due to climate change and marginalization, which include all families living in poverty or extreme poverty. The project will give priority to women, youth and adolescents, adopting a flexible approach tailored to the culture, needs and demands of these groups within each specific ethnic community.
42. **Gender strategy.** The Project aims to impact gender equality and strengthen women's empowerment in the semiarid region of Northeast Brazil by transforming social and cultural norms regarding gender roles. As such, it aims to be gender transformative. At least 40% of the beneficiaries will be women. They will be involved in decision making throughout the project such as in the development and implementation of TRIPs, collective areas sustainable management, encouraged to become farmer-trainers and other leadership roles. PCRP will support economic empowerment of women by increasing access to and control over assets and services through the promotion of Climate Resilient Productive Systems (CRPS) in family farms and backyard gardens, diversifying and increasing income opportunities as well as sensitizing men and boys as a strategy for supporting women's economic engagement. Equitable work balance will be encouraged using "cadernetas agroecológicas" to engage household members in analysing and addressing gender inequalities in roles and stimulate discussions on redistributing household tasks among household members, as well as introducing labour- and time-saving technologies (e.g. eco efficient stoves, biodigesters and improving access to water) and engaging men to improve household nutrition. Special attention will be given to supporting female-headed households.
43. **Youth Strategy.** The main goal of the youth strategy of the PCRP is to improve social and economic empowerment of youth in the semiarid of NEB. Three categories of youth will be targeted: (i) young people living in rural areas who have no education or only basic education; (ii) young entrepreneurs; and (iii) school-going youth. Special attention will be given to young women and those coming from indigenous and traditional communities. Youth will consist of at least 50% of the beneficiaries. They will be engaged in policy discussions, in the development and implementation of TRIPs, in the farmers networks and will be essential in the communication strategy (young communicators network). Youth will be trained in short-term professional courses, nutrition and CRPS. They will be encouraged to develop enterprises to support family farmers. There will be specific work with schools,

where youth will take lessons learned home on CRPS and good nutrition practices. By diversifying farm's products, youth will have opportunities to develop and market new products.

44. **Nutrition strategy.** To maximize its contribution towards improved nutrition, the project will promote the increasing and diversification of food production with attention to nutrition products, and their consumption at the household level. CRPS will integrate nutrient rich foods with the aim of increasing self-consumption of rural families and reduce the household's budget used for food purchases. In indigenous and traditional communities, attention will be given to promote the use of neglected and underutilized species (NUS) with high nutritional value. To ensure that diversification of agricultural production would translate into improved diets, the project will support beneficiaries in addressing gaps in nutrition knowledge: fundamentals on nutrition will be integrated in the technical assistance delivered by the service providers and training for cooks and students will be included in the schools where CRPS are implemented. Furthermore, the adoption of social technologies to improve water management will directly contribute to increased food production and reduce risks related to unhealthy environments. Labour-saving technologies for women will help decreasing their burden of work, being women the main responsible for food production and preparation at the family level.

D. Components/outcomes and activities

45. The project will consist of three complementary and mutually reinforcing components (pictured in the diagram below) to promote climate resiliency as well as emission mitigation:
1. Climate Resilient Productive Systems (CRPS)
 2. Water Access
 3. Knowledge Management and Scaling-Up. Selection of the productive systems and water access technologies to be promoted are described in the Feasibility Study (Working Document 1).
46. To ensure coherence and efficient management, PCRPs structure has been defined considering a mix of GCF and IFAD requirements. As such, the project as a whole consists of components, which lead to specific outputs, which in turn are developed through activities and sub-activities (as defined by the GCF). The PCRPs also includes a LF which produces outcomes and outputs (as defined by IFAD).



COMPONENT 1. Climate Resilient Productive Systems (CRPS)

47. This component's main objectives are to implement diversified agroforestry systems that will increase local water availability in the productive system with farmers and communities and, empower them to manage these systems sustainably increasing their food and nutrition security, and promote women and youth leadership. With this aim, investment strategies have been designed to meet demands of family farmers and communities with different land areas, climate-resilience and adaptation requirements, and productive objectives.
48. In addition to the adaptation benefits and resilience capacities (which will be monitored using the resilience scorecard and index - see Appendix of Annex 8 - developed for the project), the accumulated GHG mitigation potential of implementation of activities in Component 1 amounts to -6.7 tCO₂eq per hectare per year, or about **-11 million tCO₂eq over the entire 20-years-period of analysis.**

The State Governments through state-level subprojects will be the implementing agencies for this component.

Through the implementation of CRPS and relevant cross-cutting activities, the project will deliver **Output 1.1. Increase climate resilience for family farmers and traditional communities while mitigating carbon emissions by applying CRPS.**

49. **Activity 1.1.1. Selection of Project Areas and Development of Territorial Resilience Investment Plans (TRIPs)** This activity will select the project's implementation area. TRIPs will be developed for all selected areas, and will act as "master plans"

to guide the project's collective and individual investments in CRPS as well as water harvesting and storage infrastructure.

50. TRIPs will be the planning tool for all activities under Components 1 and 2 as well as the capacity building activities of Component 3. They include diagnostic and mapping of landscape and community vulnerabilities and the identification of needed investments, resources, capacity building and other initiatives to achieve the objectives of building resilience and improved food security, nutrition and incomes of the participating communities and family farmers. Specific efforts will be made to ensure the TRIPs reflect the needs of women and youth and when relevant indigenous peoples and traditional communities. Each TRIP will cover an average of four territorially contiguous communities. Once completed, the TRIPs will be submitted to the project for approval.
51. Technical assistance (TA) teams will design TRIPs with full involvement of concerned communities and family farmers based on the Manual for Designing Productive Investment and Business Plans adapted to the TRIPs. A total of 575 TRIPs will be developed. Since each plan will serve an average of four communities in a specific territory, an estimated 2,300 community and farmers' associations will participate in the development and implementation of the plans and benefit from capacity building. Each plan will have a gender strategy and a youth engagement strategy which will be adopted by the associations. The TA teams will also play a critical role in terms of ensuring that PCRP beneficiaries comply with the Environmental Registry (CAR) in line with the Forest Code.
52. For the implementation of the TRIPs, the beneficiary groups (such as associations or organizations) will plan their activities in the framework of pre-defined Agroforestry System Investments (ISAs acronym in Portuguese), for which they will receive non-reimbursable funds and contribute with at least 10% of the total IP value, in kind or in cash (in-kind contributions will be monitored only by IFAD and will be excluded from the CGF funding proposal). There will be four different ISAs in the framework of TRIPs implementation: ISA Família for family farms, ISA Escola for schools, ISA Quintais for backyard gardens, and ISA Coletivo for collective areas, as detailed below.
53. **Activity 1.1.2 Implement CRPS in family farms and backyard gardens.** This activity will support groups with household-based productive investments that will increase the resilience to the effects of climate change. The group-based approach will facilitate joint learning and the adoption of technologies and practices to implement CRPS with TA for capacity-building and initial monitoring.

1.1.2.1. Implement CRPS in family farms - ISA Família

54. **Objective.** Reduce production vulnerability to droughts, increase income, improve food security and nutrition, and strengthen women's role while developing a progressive culture of multiple sustainable uses of productive areas.
55. **Selection criteria.** Target beneficiary families (see task 1.1.1.1) that already have water for production.
56. **Investments.** Resources to implement the CRPS [\[32\]](#), and TA for 3 years per family
57. **Area:** 31,000 plots with an average of 1/2 hectare each (total 15,500 hectares). Monoculture crops will be converted into climate resilient production systems with multiple crops allowing for soil conservation and recycling of biomass and nutrients.

1.1.2.2. Implement backyard gardens using CRPS - ISA Quintais

58. **Objective:** Develop irrigated, diverse and productive backyards in conjunction with activities in Component 2, applying CRPS principles to reduce families' food and nutrition insecurity from droughts and strengthen the role of women in production. Increase households' production of nutrient-rich crops and nutritious foods for own consumption, including Neglected and Underutilized Species (NUS) (especially in quilombola and indigenous peoples' communities).
59. **Selection criteria.** Beneficiary group families (see task 1.1.1.1) that do not have water for production. Same beneficiaries that will receive water access investments in Component 2.
60. **Investments.** Resources to implement CRPS
61. **Area.** 36,000 gardens with an average size of about 0.21 hectare each (7,500 hectares expected)
62. **Activity 1.1.3. Implement Collective Resilient investments.** The funds for collective investments are also non-reimbursable and will follow the same co-funding and TA as individual investment in activity 1.1.2.

1.1.3.1. Implement Collective Areas Sustainable Management (CASM) - ISA Coletivo

63. With increasing population and land use in the Semiarid, the common areas of the Caatinga are under threat of gradual depletion, mainly due to timber extraction for firewood and overgrazing.
64. **Objective.** The main objective is to improve the ecosystem services provided by the Caatinga, such as micro-climate regulation, carbon sequestration and fixation, pest and disease control, provision of water, decomposition of waste, natural pollination of crops and other plants, and provision of raw materials (timber, seeds, nuts, fruits, etc.). The system will stabilize and, if possible, increase the supply of forage. The benefits of the enhanced ecosystem services will provide incentives for the community to be the main stakeholders in the conservation and recovery of the system which they live in.
65. New options for income generation are needed, especially for women and youth, and the increase of forage for the herd will increase the animal gain of weight and compensate for possible loss of income due to the herd's reduction. It is possible to develop a slow and progressive culture of multiple and sustainable uses of the Caatinga and reduce extensive grazing, while increasing income, encouraging family succession, and conservation and recovery of the ecosystem services offered by the Caatinga.

66. Selection criteria. Communities that have a collective use area of around 500 hectares or more.

67. Undertakings:

- Recover degraded areas using CRPS;
- Decrease timber demand by implementing eco-efficient stoves and biodigesters;
- Increase supply and efficient use of water for production;
- Structure community seedbanks and nurseries;
- Promote low-impact productive activities in collective areas (e.g., beekeeping).
- Strengthening community governance of access and sustainable use of the areas, with specific attention given to strengthening women's and young people's access to and control over these resources.

68. Area. 60 CASM with an average size of 600 hectares each (total 36,000 hectares).

69. Investments. Tools and materials for implementing CRPS, nurseries, seedbanks, eco-efficient stoves and bio-digesters, and TA for 2 years per community.

1.1.3.2 Implement CRPS in Schools - ISA Escola

70. Rural schools are where young people, children of farming families, acquire knowledge on various subjects, such as rural life and agricultural production. The project will seek to enable these educational institutions to facilitate understanding of climate change vulnerabilities, mitigation and adaptation options for the semiarid and work on CRPS, rational use of water for production, nutrition education, renewable energies, and other climate resilience practices.

71. Objective. Enable rural educational institutions for youth to experiment and teach climate change, resilience and CRPS, rational use of water for production, renewable energies, and other resilience practices to students. Target the cooks who prepare school meals, encouraging them to prepare balanced meals to promote healthy diets, also using native fruits and vegetables, reinforcing children's food and nutritional security. Promote nutrition education and dietary diversification in schools according to the socio-cultural characteristics of the target groups (traditional communities, indigenous peoples).

72. Selection criteria. Rural schools within a range of the target areas. Preference will be awarded to Family Agriculture Schools (EFAs).

73. Undertakings:

- CRPS teaching and experimentation;
- Development and maintenance of nurseries and seedbanks;
- Promotion of entrepreneurship in CRPS; and
- Training for cooks and students on good dietary practices and nutrition education, including the nutritional value of native fruits and vegetables and their use to diversify and enrich diets.

74. Area: 1,000 schools (100 families per school) with 1/10 hectare each (total 100,000 families and 100 hectares).

75. Investments: Resources to implement the CRPS, such as seeds, seedlings, organic fertilizers, equipment rental or purchase, irrigation systems, tools, fences, nurseries, training materials, computers, etc., and TA for about 3 years per school.

1.1.3.3 Test productive models of Bio saline agriculture

76. In the Semiarid, brackish or salty groundwater is common. Around 25% of wells have freshwater (<500 mg/l TDS^[33], 33% are brackish (501–1,500 mg/l TDS), and 42% salty (>1,500 mg/l TDS). An estimated 75% of the wells in the Semiarid are unfit for human consumption^[34]. There are over 500 desalinization units operating in NEB, which produce residual water that currently accumulates in evaporation tanks with no productive use.

77. Objective: Develop pilot testing of productive activities using effluent from the desalination process.

78. Selection criteria: Communities benefited from collective desalinization systems.

79. Undertakings: Fish breeding and irrigation of halophyte plants in small areas^[35].

80. Investment: Fish, tanks, irrigation equipment, resources to implement the CRPS, soil laboratory tests, etc., and TA for 2 years per community.

81. Number of bio-saline production systems: 24 bio-saline systems each irrigating 1 hectare and benefiting 50 families (total 1,200 families and 24 hectares).

Activity 1.1.4 Build a Farmers Network and Promote local entrepreneurship for products and services that support family farming

82. To facilitate the replication of CRPS, support will be provided by: i) TA teams operating in a territory-based intervention strategy, and ii) small grants and business management support to microenterprises that innovate and produce specific tools and equipment to facilitate the implementation of CRPS. All investments described above will be accompanied by TA teams for 2 years.

1.1.4.1 Build a Farmers Network

83. The following tools will be used to build a farmer's network for supporting the wider adoption of CRPS:

1.1.4.1.1 Train Farmers

84. TA teams will train interested farmers and young promoters in CRPS principles and practices; basic nutritional diets as well as food safety, sanitation and hygiene practices (WASH); home-food storage, food processing and conservation practices; water access technologies; gender-transformational approaches (see Working Document) and approaches appropriate for indigenous and traditional communities (see Working Document). TA will be responsible to attract and engage youth so that at least 50% of the participants will be young farmers or promoters.
85. In addition, farmers who already implement aspects of CRPS will be invited to be farmer-trainers. Their selection will not be limited by the criteria of target group or property size. They can have several roles in the project; from integrating the TA teams, providing visits to their farms as demonstration plots, or participating in local farmer networks, trainings and workshops. The project will ensure both women and men become farmer-trainers. Building on the positive experience of IFAD-supported projects in Brazil, the contributions of women as "farmer-experimenter" or "agricultoras experimentadoras" will be recognised by valorising their knowledge and innovative capacities in running businesses or managing natural resources.

1.1.4.1.2 Hold exchange visits

86. An important source of practical information and knowledge sharing. They involve organizing a group of farmers to visit another farmer or group. Although usually the visit is done to a 'more advanced' group, it is not a one-way process, because visitors discuss and comment on what is being observed. These initiatives are often more effective than courses or lectures on the same topics due to language similarity and experience of real-life situations. Farmers from 5,000 medium-sized farms (at least 5 hectares) located in the project's region will be invited to participate in the exchange visits. There will be an active participation of Young Communicators who will have an active role participating in these exchanges (described in Component 3).
87. Messaging apps are widely used in Brazil and can be applied to bridge communication gaps in farming communities and as virtual means of providing TA services. TA can create and manage online social-media groups to share experiences on specific topics and solve problems promptly. These groups can further the sharing of the knowledge learned in the exchange visits.

1.1.4.2 Promote local entrepreneurship for products and services that support family farming

88. Most small-scale products and tools available to farmers are directed towards traditional large-scale monoculture, creating a vicious cycle that makes farmers turn to non-resilient production practices. Specialized small-scale equipment and mechanization can make farmers more productive and able to add value to their production.
89. The few scattered farmers who dare challenge the conventional model must develop or adapt their own tools. During project design field visits to the states of Bahia and Pernambuco, the design team witnessed several examples of these innovations: forage palm chopper and feeder, long-arm pruning shears, wood chipper, and low-tech water reuse facility, among others. This thriving creativity and potential demand face high barriers to their widespread use. Microentrepreneurs in this sector are mostly small and lack the management capacity for commercial financing, making efforts to scale up or even start their businesses nearly impossible. Their innovations usually never go beyond their plot.
90. With greater access to capital – especially with management assistance, and sustainability conditions tied to it – microentrepreneurs with businesses that have a direct impact on climate resilient agricultural production can scale up their operations and influence family farmers beyond the project's direct beneficiaries to improve their practices. A dynamic business environment can also attract youth.
91. The project will support investment in small-scale mechanization of microenterprises^[36] that provide services or products for improving family farmers' CRPS, thereby enhancing rural entrepreneurship. Small grants and business management support will be offered to support microenterprises that innovate and produce specific tools and equipment, nurseries, composting services, apps to manage production, organic fertilizers, pest control, and market platform, etc. The GCF grant will cover the incremental costs associated with higher-than-average screening, evaluation and technical assistance costs of the investments.

COMPONENT 2. Water access for production

92. The purpose of this component is to disseminate practices in efficient water capture, harvesting, storage and use to decrease vulnerability of livestock and crops to rainfall irregularity and prolonged droughts. All investments in this component will be financed as determined in the TRIPs for beneficiary groups (described above). The State Governments through state-level subprojects will be the implementing agencies for this component.
93. Component 2 beneficiaries are selected from a pool of families that will implement backyard gardens (described in sub-activity 1.1.2.2) but do not have water for production. Irrigation in small plots allows diversified production, mainly with fruits and vegetables, for family consumption and to sell surpluses.
94. The TA provided to the beneficiaries will focus on addressing issues of efficient water harvesting and management, good irrigation practices, techniques for limiting evapotranspiration, and precautions to prevent soil erosion and salinization. All pumping systems will use renewable energy (photovoltaic or wind).
95. All water infrastructure methodologies selected in the PCRPs are widely disseminated in NEB and are extremely simple to build, known in Brazil as "social technologies". Construction of the water infrastructure technologies listed below is usually carried out by trained community masons, beneficiary families, and their neighbours with oversight from TA teams^[37]. In addition to creating an activity for local workers, it also ensures future maintenance of the cisterns without relying on outside services. Technical

training and instalment and maintenance of equipment and structures and in water management will be systematically provided in association with the construction process. For further description of these technologies, see Feasibility Study in Working Document 1.

Through the use of water technologies, the project will improve water access to family farmers and traditional communities to reduce the impact of severe droughts by investing in small-scale technologies for harvesting, reuse, treatment and storage.

Through the use of water technologies, the project will deliver **Output 2.1 Improve water access to family farmers and traditional communities to reduce the impact of severe droughts by investing in small-scale technologies for harvesting, reuse, treatment and storage.**

Activity 2.1.1 Build boardwalk cisterns for backyard gardens[\[38\]](#)

96. Investment: Materials to construct cisterns; irrigation equipment. Construction of a plate tank with storage capacity of 52 m³, coupled with a 200 m² concrete water-catchment area (boardwalk or *calçada*). Additionally, continuous TA for 2 years per family.
97. Application: Irrigate small plots to support short-cycle crops (mainly vegetables) during dry season. The role of women in this production is fundamental. High impact on family food security and nutrition.
98. Total: 20,000 cisterns.

Activity 2.1.2. Implement social technologies to increase water in the field

2.1.2.1 Build small farm ponds[\[39\]](#)

99. Investment: Small-width deeply excavated reservoirs that store at least 500 m³ of rainwater to reduce evaporation and retain water for longer periods, and continuous TA for 2 years per family.
100. Application: Irrigate plots and support short-cycle crops during dry season.
101. Total: 500 farm ponds.

2.1.2.2 Construct small groundwater storage basins

102. Investment: Construction of small underground dams through a transversal blocking system along temporary streams and river banks, with flexible plastic sheeting lining a trench (from surface to rock or impermeable layer). Additionally, continuous TA for 2 years per family.
103. Application: Capable of irrigating larger areas and storing a significant quantity of water for several months.
104. Area: 500 small underground dams.

Activity 2.1.3. Implement treatment and reuse systems for household wastewater

105. For rural families, untreated water represents risks to the environment, soil, and human health. Only 27% of the NEB population (mostly in urban areas) has access to sewage collection and treatment[\[40\]](#). The treatment systems selected use simple and affordable technology based on recycling water and nutrients for food production. These technologies adapt forms of rural sanitation to the household level and contribute significantly to sanitary improvement of environmental and living conditions of beneficiary families.

2.1.3.1 Implement systems for grey water reuse

106. Investment: Construction of treatment system consists of filtering grey water residues through physical and biological mechanisms, in which organic matter is biodegraded by microorganisms and earthworms. Additionally, TA for 2 years per family.
107. Application: Irrigate small plots, such as backyard gardens and nurseries.
108. Area: 10,000 greywater treatment systems irrigating 1/5-hectare plots (2,000 hectares).

2.1.3.2 Implement green septic tanks

109. Investment: Construction of evapotranspiration tank (or green septic tank). Anaerobic digestion, which occurs in septic bed, consumes organic matter from household waste in the root zone of the plants. Additionally, TA for 2 years per family.
110. Application: Can irrigate trees (usually banana trees, which are part of the treatment systems) and non-edible plants.
111. Area: 5,000 blackwater treatment systems irrigating 0.05-hectare plots (250 hectares).

Component 3. Knowledge management and scaling-up

112. Component 3 supports and expands on the activities in Components 1 and 2. The activities described below will be explored in the project so that information flows serve both to consolidate learning among families who will experience new approaches in CRPS and water access as well as to scale to a regional and international level the adaptation and mitigation measures that the project will propel. Strategies developed will drive upscaling and deliver CRPS and small-scale water harvesting system disseminated in the NEB semiarid and abroad to increase climate resilience of vulnerable communities.

Part Activity 3.1.2 (3.1.2.1 Promote south-south cooperation; 3.1.2.2 Facilitate discussions to unlock policy barriers) and part of Activity 3.1.3. (Plan, Monitor, Evaluate and Learn at national level) will be conducted through the establishment of the Planning,

Monitoring, Evaluating, and Learning Team Unit, which will be selected by BNDES following an open selection process. The rest of the Component 3 will be implemented by the state level subprojects.

Strategies developed will drive upscaling and deliver **Activity 3.1 CRPS and small-scale water harvesting system disseminated in the NEB semiarid and abroad to increase climate resilience of vulnerable communities**.

113. Activity 3.1.1. Raise awareness and build capacities of women, youth and traditional communities

114. This activity combines several strategies: i) highlight the leading role of youth and women as 'knowledge managers and generators' and 'local talents'; ii) consolidate laboratories for learning, exchange and replication of sustainable practices in communities through a set of printed and audiovisual materials; iii) facilitate dynamic M&E of socio-environmental impacts, which will be registered in materials that allow effective influence in spaces dedicated to public policy making.

3.1.1.1. Develop a young communicators network

115. A total of 450 young people will be selected to participate in a media resource empowerment program focusing on successful experiences in accessing water resources and CRPS, following which they will be engaged as Young Communicators (YCs). In addition to being responsible for registering activities and facilitating production of audiovisual and printed materials, YCs will act as "social mobilizers", fulfilling a crucial role in social organization processes.

116. Another important initiative in which YCs will take part, together with the farmers' network (see activity 4.1), is the construction of a participatory monitoring model with audiovisual resources.

117. Local and regional exchanges between YCs will be promoted. YC will work closely with TA teams and community-based partner organizations. Each will receive a scholarship through a "learning grant" and have access to equipment (mobile phones and notebook computers).

3.1.1.2. Strengthen capacity for women, youth, and traditional communities

118. All educational activities (workshops, courses, exchanges, etc.) will follow a "learn by doing" approach that explores experimentation of alternative technologies and information exchange among community members. Given that women, youth, and traditional communities tend to be on the margin of community-based organizing efforts, the project will prioritize capacity-building opportunities targeting these groups.

(i) **Rural women.** Building on the experience of other IFAD-supported projects in Brazil, the project will strengthen rural women's capacities as part of a comprehensive environmental education program that explores the connections between feminism, women's rights, the Semiarid region biomes, agroecology, and food and nutritional security. It will seek to increase women's access to and control over assets – inputs, technologies and finance – and new income opportunities for women. The use of "cadernetas agroecologicas" or agroecological logbooks will be promoted to capture the (economic) contribution women make to their households. Sensitization on preventing and addressing gender-based violence will be included in training material for all project beneficiaries.

(ii) **Youth.** In addition to YC networks, youth will be involved in short-term professional courses with a focus on diversity of production systems and CRPS. The youth will then be incorporated in TA teams and serve as liaisons with families.

(iii) **Traditional communities.** Implementation of sensitivity trainings for TA professionals in issues of gender, race and ethnicity, with a focus on methodological approaches and instruments that address the relationship these communities have with division of labour, natural resources and land management practices. The second line of action involves conducting case studies in traditional communities.

(iv) **Nutrition.** The Project will integrate basics on nutrition, enriched and diversified diets based on locally available foods, food safety practices and sanitation and hygiene practices (WASH) in guidebooks and manuals.

Activity 3.1.2. Drive scaling-up, unlock policy barriers and experiment with CRPS and resilience participatory monitoring model

3.1.2.1. Promote south-south cooperation

119. Another aspect of this project involves developing capacities by sharing knowledge, skills, resources and technologies among countries through the construction of a more horizontal relationship of solidarity than the classic "North-South" cooperation. At the start of implementation, the exchange sites inside and outside Brazil and the prioritized systematization methods will be identified. In addition to TA team members, farmers will be invited to participate. The project will invest in construction of a database cataloguing the practices and technologies for proper management of natural resources that have been identified in these different contexts and with documented benefits for the adopting farmers and communities. The DAKI grant will also serve as a vehicle to identify possible SSTC activities as it is implemented in drylands of Brazil, Argentina and El Salvador. The SSTC Hub in Brasilia will play a critical role in the SSTC activities of the project and will ensure linkages with other IFAD SSTC Hubs.

3.1.2.2. Facilitate discussions to unlock policy barriers

120. The National Forest Code requires farmers in the Northeast to preserve 20% of their land as legal reserve. Family farmers,

however, can perform certain productive activities on their legal reserves, such as agroforestry and beekeeping. The Forest Code anticipates that States may implement a legal reserve quota market, on which farmers that preserve more than their required 20% could sell their quotas. Several policies that are constraining family farmer's CRPS were identified during project design. The most notable include: i) lack of an Environmental Reserve Quota (CRA in Portuguese) market; ii) norms and regulations preventing family farmers from accessing markets, and iii) gender-based violence. These three areas will form the major themes in the policy dialogue effort of the project and will involve federal partners as well as regional, state level and local stakeholders.

121. As recommended by the World Bank^[41], establishing the CRA market as defined by the Forest Code Law 12.651 could provide additional incentives for family farmers to increase the area covered by the climate-resilient agriculture principles laid out in the project. CRA is instruments created by the Brazilian Forest Code to allow for Legal Reserve offsetting between rural properties. However, thus far, none of the NEB has implemented CRA, which could become a source of income for family farmers who choose to implement CRPS. A CRA credit produced on a beneficiary's property could be used to offset a legal reserve (RL) debt on another property within the same biome, preferably in the same state. The RL debts represent obligations acquired by any given farmer that can be efficiently offset by environmental improvements produced by smallholder farmers with CRPS, thereby generating a transfer payment from the RL offender to the smallholders. Implementing a state CRA could create a market for forested lands, adding monetary value to a preserved Caatinga. Given the high costs of restoration/reforestation in the Caatinga and the climate-resilient agriculture principles laid out in the project, exchange of CRAs could become an effective way to facilitate Forest Code compliance, meeting NDC targets and preventing deforestation of surplus native vegetation.
122. The Committee on World Food Security and FAO (2016) recommend that governments employ public policy to support family farmers with respect to issues such as pricing policies, public procurement, food safety and standards, and appropriate credit and infrastructure. Family farmers in Brazil are affected by top-down imposition of food safety standards designed to respond to large-scale mechanized and standardized food production for commodities and large distribution channels. As a consequence of these entry barriers, family farmers revert to informal markets with lower demand and prices.
123. When it comes to rural women, the situations of violence in Brazil are intensified because they are further away from social, political and community resources that could promote greater protection. As a result, violence takes on complex and multiple forms and is manifested in everyday social relationships, evidenced by discrimination regarding land tenure, treatment and management and the "male legitimacy" of the sexual division of labor.
124. The project will facilitate policy dialogue on the issues mentioned above. The proposal is to take advantage of existing organizational structures at federal, regional and state level, reinforce them and only if necessary, create new ones. These working groups should involve a broad set of stakeholders (e.g., federal ministries, state partners, project beneficiaries, civil society, private and public sectors and other international organizations) and develop a roadmap to implement the CRA markets, improve regulatory conditions for family farmers' access to markets, reduce gender-based violence and implement nutrition policies. It will also commission research on targeted policy and regulatory issues. Youth will be encouraged to have active participation and leadership in these groups.
125. To qualify the inputs made in these forums on public policy, materials (publications and videos) will be produced that present results of the actions undertaken, in accordance with the progress indicators used in the M&E system. These publications – that present concrete social, environmental and economic results of transitioning to a model of family farmer CRPS – can influence public opinion, which in turn can contribute to the "scaling up" process. More activities related to policy-dialogue will take place under Knowledge Management and M&A see activity 3.1.3.

3.1.2.3. Experiment with CRPS and resilience participatory monitoring model

126. Since transition to CRPS is gradual and its social / economic / environmental impact not immediately perceived, a monitoring methodology is needed that demonstrates and gives visibility to transformations promoted during implementation. Systematization processes will be published and subsidize political advocacy processes, reaching external stakeholders, such as public managers and institutions working on related topics.

Activity 3.1.3. Plan, Monitor, Evaluate and Learn

127. As its main M&E system tool, the project will use the DATA.FIDA Brazil country system currently used by all IFAD-supported projects in Brazil. The system will be customized for BNDES utilization. An independent baseline survey, closing evaluation and mid-term review is part of the project.
128. Activities will take place at national and state level and will be interrelated and reinforce policy dialogue activities under Activity 3.1.2 Scaling-up and sharing, as follows:

At National level, undertakings include: building-up an information platform based on systematizations and innovation experiences, 12 GIS evaluations (4 at start-up, 4 at midterm and 4 at completion), contracting yearly M&E, IT and Communications services, preparing the Project Completion Report, carrying out M&E meetings and planning workshops (one per year) and elaborating 4 Studies, Systematizations and other Knowledge Management products (2 at mid-term and 2 at completion). It also involves elaborating the baseline study, mid-term review and impact evaluation including the Women's Empowerment in Agriculture Index (PRO-WEAI) Study, Minimum Dietary Diversity for Women (MDDW) Studies and the resilience scorecard and index survey (see Project Implementation Manual in Annex 8, Appendix 1).

At State level, undertakings include: 12 Studies, systematizations and other Knowledge Management products (4 per State), 21 planning workshops, 21 M&E meetings and 21 Territorial Committee Meetings (1 per year per State). Finally, the M&E system at the State level includes at least 3 more State-specific studies policy-related areas such as gender violence, CRA market access and sanitary regulation for family farming.

Project management

129. Although not a separate component, as per GCF guidelines, management activities are grouped under a separate heading, including the establishment and operation of the SIUs at state-level. As the CPMU will be operated by BNDES in its capacity as project manager and co financier, the operating costs of the CPMU are not included in the project costs.

E. Theory of Change

130. Family farmers in the semiarid rely on agriculture for their livelihoods. However, these agricultural systems in the drylands are adversely affected by land pressure and climate change. With reduced productivity, farmers turn to even more intense production methods, which exacerbate degradation of soil and biodiversity, resulting in adverse feedback on climate, food and nutrition security and on-farm income (please refer to Climate strategic pathway in Annex 02). In particular, **current practices place severe strain on limited water resources**, making smallholders extremely vulnerable to ever more frequent drought periods. The PCRPP aims to break this negative feedback loop, transforming family farmers' productive systems in the semiarid NEB by increasing production while simultaneously improving farmers' capacity to face the challenges posed by ongoing climate change. It will work with poor family farmers and the **most marginalized and vulnerable groups of the poorest region** in the country, such as Indigenous and Traditional Peoples (I&TP), women and youth. The **project will result in resilient and productive farming systems performing restored ecosystem functions**, which, in turn, both increase and stabilize family income, **empower women and youth and improve food and nutrition security**.
131. The project will promote a paradigm shift in smallholder agricultural production to face the challenge of drought and increase the resilience of smallholders in NEB. Given the vulnerabilities, ecosystem characteristics and current and potential future changes in climate, climate resilient agriculture for family farmers and I&TP in the Brazilian semiarid translates into practices that increase availability, flow and retention of water in the system. Pragmatically, it means simultaneous implementation of the following practices and principles, (denominated CRPS): (i) soil preparation: maintenance of dispersed trees, setting up cradles and natural fertilization; (ii) soil protection: soil cover and biomass production and reintegration in soils with resilient plant varieties; (iii) water management: capture and storage (both in soil, vegetation, ponds and underground dams), level curves and terraces; (iv) planting complex agroforestry systems: stratification, diversification and densification with herbaceous, shrub and tree species maximizing photosynthetic capacity; (v) management: active pruning and thinning; and (vi) grazing: pasture rotation, fences and silage. While the implementation of such practices requires investment and inputs, equally important is the behavioural change that is needed to ensure farmers adopt and embrace new farming techniques.
132. Implementation of CRPS, as proposed under Component 1, will influence hydrological, vegetation and soil conditions across the landscape. The Caatinga can be a rich and productive area, with fertile soils, provided that adapted vegetation is used, with adequate arrangements and techniques appropriate to the levels of humidity and solar radiation. Farmers and I&TP communities will be supported to implement CRPS through an extensive Technical Assistance program. While the focus will be on improving production practices, the program encompasses essential livelihood and empowerment aspects including food and nutrition security, social roles, resources governance, governance of farmers organizations, networks for exchange of best practices and access to markets, and stimulation of entrepreneurship and innovation. All professionals who will be providing technical services under the project will be provided sensitivity training in issues of gender, race, ethnicity, and public health, with a focus on methodological approaches and instruments that ensure compliance with the FPIC process and consider each community's way of life, and the relationship they have with natural resources and their land governance and management practices.
133. The water access solutions proposed in Component 2, such as rainwater harvest and storage, if accompanied by the current agricultural model, may be temporarily palliative – subject to severe water loss due to high evapotranspiration from heat and wind – but with limited impact in terms of sustainable production in the medium and long term. In fact, water investments in the semiarid must be complemented by soil and vegetation recovery practices promoted in Component 1, to allow infiltration of rainwater, increase soil biomass rate, create shade and wind shelters to reduce evapotranspiration (which can exceed 2,000 mm/year). The specific flora and fauna in the semiarid have developed a high capacity to access and store water (in roots, trunks, stems and leaves), resulting in a biota capable of supplying more water than needed for growth and reproduction, adding surplus water to the system. In this transformation of the productive system, the first years of the CRPS implementation are the most vulnerable. Water harvest and storage systems implemented as a priority during the initial years of the project will increase the availability of water in the system and reduce impacts of droughts while the system is still fragile.
134. Knowledge management, policy dialogues, communication, and monitoring and evaluation (M&E) activities under Component 3, meanwhile, will allow the investments under Components 1 and 2 to be sustainable and scaled up to other states in the region and dryland areas, including other countries, resulting in the intended gender transformation, nutrition improvement and youth leadership.
135. Within each community or group, the project will work with families who are at greatest risk of falling into conditions of food insecurity due to climate change and marginalization, which include all families living in poverty or extreme poverty. When present in the selected states, I&TP will be directly targeted as communities, proactively informing them about the project and consulting them about their initial interest in participation. PCRPP will take a holistic gender transformative and youth inclusive approach that focuses on the economic, political, economic and cultural causes of vulnerability of different groups. It aims to transform power relations shaped by unequal patriarchal norms and practices, and to empower women so they have greater capacity to adapt. As such, the project will promote equal access to and control over resources and assets, address women's time poverty due to care and domestic work and open up spaces for discussion, collaboration, participation and decision-making. Youth play a key role in tackling climate change, PCRPP will therefore support their early adoption of new technologies and approaches that can boost more sustainable agriculture, make sure their voices are heard and empower them as agents of change. It also includes activities to improve the quality of diets of project's beneficiary households by increasing availability and accessibility to diversified and nutritious foods and training on basics of nutrition, enriched and diversified diets, food safety practices, sanitation and hygiene practices (WASH). Please see Youth, Gender, and Nutrition strategic pathways in more detail in Annex 02.
136. While CRPS practices have the potential to yield sustainable land-management and nutrition benefits as well as increase production and income, they require a significant change in habits, culture and investments. Thus, the project supports the entire productive transformation process and is tailored to respond to the needs of individual farms and communities. This ensures that the appropriate CRPS are selected and implemented based on the specific local context, and that farmers are fully supported throughout the transition. (Feasibility Study Working Document provides a detailed description of the designed methodology to

promote behavioural change). GCF and IFAD support will enable farmers to take a longer-term perspective in anticipation of the significant financial, economic and livelihood benefits achievable through the application of adaptation measures relative to the declines in production and income that are anticipated to result from the effects of climate change. It responds to the urgency that climate change projections give to the application of these practices, and recognizes that for them to function effectively as adaptation measures, they must be applied as part of a larger-scale program and be calibrated and adjusted based on the specific needs, priorities and cultural context, both at the regional and family-productive-units levels.

F. Alignment, ownership and partnerships

137. The project is aligned with the UN 2030 Agenda objectives, more especially with SDG 1: No poverty, SDG 2: Zero hunger, SDG 5: Gender equality, SDG 6: Water and sanitation, SDG 7: Affordable and Clean Energy, SDG 8: Decent work and economic growth, SDG 10: Reduced inequalities, SDG 13: Climate action, and SDG 15: Life on land.
138. The project is included in the Brazilian National Strategy for the Green Climate Fund and is aligned with the Brazilian National Policy on Climate Change, Nationally Determined Contribution (NDC), programs to strengthen family agriculture (such as PRONAF), the National Plan for Food and Nutrition Security, the National Policy for the Sustainable Development of Traditional sanitation, Peoples and Communities, and the Food Purchase Program. It has been approved by the Commission for External Financing (COFIEF) of the Ministry of Economy in September 2019 and received the No Objection from the National Designated Authority (NDA) within the Ministry of Economy, confirming its alignment with national development priorities and strategies.
139. To receive approval by the Federal Government, a Consultation Letter (Carta Consulta) had to be developed and presented for review by the Technical Group (GTEC) and approval by the Commission for External Financing (COFIEF) both part of the Ministry of Economy. The Carta Consulta was prepared in partnership with BNDES and contains general and specific objectives, components, activities and cost tables which cannot be changed after approval and review by COFIEF according to Resolution is issued by the Federal Government.
140. BNDES and the GCF are strategic partners whose commitment and experience will add value to the project cycle and maximize the achievement of goals. BNDES is accredited to the GCF since July 2019, has national influence and a high capacity to mobilize resources, disseminate lessons learned to other bank programs and include CRPS projects in its lending portfolio. GCF will leverage IFAD's and BNDES's resources to test agricultural methods that otherwise would not be possible.
141. **Corporate alignment.** The project is aligned with the Strategic Objectives (SOs) of IFAD's Strategic Framework 2016-2025. It will contribute to SO1 (**Increase poor rural people's productive capacities**) through improved access to and management of natural resources and adoption of improved farming practices. It will also help achieve SO3 (**Strengthen the environmental sustainability and climate resilience of poor rural people's economic activities**) through adoption of climate resilient production systems, increased access to water resources, and livelihood diversification. Transversal to the three key dimensions of IFAD 11, namely resource mobilization, utilization and allocation, the project mobilizes co-financing and catalyzes a paradigm shift towards a resilient productive system for the Brazilian semiarid region. Ultimately, the project is underpinned by the two IFAD11 thematic focuses: **environmental sustainability** and **climate change**. The PCRP is aligned with IFAD mainstreaming policies of gender transformation, youth and nutrition sensitivity.
142. **Country strategy alignment.** Project objectives are aligned with the ongoing Results-Based Country Strategic Opportunities Programme (COSOP 2016-2021) for Brazil, which was confirmed in its mid-term review of October 2019.
143. The project contributes to diversify IFAD's institutional partners and explore new co-financing opportunities. The project also helps promote the three strategic objectives the COSOP identifies for Brazil:
 - (1) increasing production and productivity, market access on favourable terms, capacity for adaptation to the effects of climate change and the human and institutional capacities of the rural poor;
 - (2) increasing the effectiveness of the rural development and poverty reduction policies, strengthening the capacities of the poor for accessing them, contributing to the coordination of policies and strengthening institutional capacities;
 - (3) contributing towards improvement in public policies through the testing, experimenting and scaling up of good practices.
144. Strategic Objective 1 is supported in Component 1, which will provide climate resilient productive systems. Strategic Objective 2 is in line with Component 2 of building capacity and community organization as well as water access. Strategic Objective 3 is inserted within both components through activities related to the application of innovations and technical support for the dissemination of good practices.
145. **Strategic Partnerships.** The project's implementation strategy is based on building partnerships, and in the search for complementarities of experiences, knowledge and other resources, to aggregate value in intervention capacity, scaling up and sustainability. This logic is valid for all three project components. For example, partnerships may be developed with federal and state universities, EMBRAPA's research centers, the National Semiarid Institute (INSA), as well as other projects and programs implemented in selected states. At the federal level, the Project will develop strategic partnerships with the ministries responsible for the corresponding thematic areas. A public consultation was organized during the Project design phase bringing together more than 120 representatives from government, civil society organizations, public and private institutions. On this occasion, it was possible to collect recommendations and suggestions that were incorporated into the project design. Another specific indigenous consultation was also held. In addition, IFAD made consultations with NEB states directly and through the Northeast Consortium of Governors (*Consórcio Nordeste*) and the Forum of State Secretaries of Northeast, which is a policy dialogue platform supported by IFAD since 2015.

G. Costs, benefits and financing

a. Project costs

146. The total project costs over the eight-year period are estimated at US\$ 217.8 million, including contingencies and taxes. Base costs are estimated at US\$ 212.3 million and both physical and price contingencies represent US\$ 5.5 million (2.5% of total costs). Investment costs are US\$ 204.1 million (94% of total costs) and recurrent costs are estimated at US\$ 13.7 million (6% of total costs). The exchange rate has been established at 4.5 R\$/US\$. The total amount of climate finance for this project is estimated at US\$ 28,309,000 or 94.4% of the IFAD investment^[42], of which US\$ 13,236,000 is expected to support adaptation activities, and US\$ 15,073,000 expected to support mitigation specific activities.

b. Project financing/co-financing strategy and plan

147. IFAD will finance USD 30 million (13.8% of the total costs) . GCF will finance US\$ 99.5 million (45.6% of total costs) with a loan of US\$ 65.0 million (29.8%) and a grant US\$ 34.5 million (15.8%). The GCF Funding Proposal has received the no objection from the National Designated Authority (NDA), the Ministry of Economy, and has been submitted to the GCF Secretariat in April 2020 and will be presented to the 27th GCF Board (to be held at a date between October and December 2020) for approval. The national counterpart will be of US\$ 73.0 million (33.5% of the total cost, including taxes, operative costs and most of staff salaries), in the form of loans from the Brazilian Development Bank (BNDES) to the participating NEB States and from States own budget/resources. Beneficiaries will contribute with US\$ 15.33 million (7% of total costs), in kind. It is expected that BNDES will maintain the same level of concessionality when financing the states. IFAD will have to provide its no objection to the financing agreements between BNDES and the states before they can be signed, which will ensure review and acceptance of the financing terms.

Table 1. Estimated Project Financing by Component (US\$ million)

Component	IFAD		GCF loan		GCF grant		Government		Beneficiaries		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Component 1	17.04	21	22.56	28	31.37	38	5.51	7	5.99	7	82.47	38
Component 2	11.76	11	42.44	38	-	-	47.60	43	9.34	8	111.14	51
Component 3	1.20	13	-	-	2.89	31	5.35	57	-	-	9.44	4
SIU	-	-	-	-	0.24	2	14.54	98	-	-	14.78	7
Total	30.00	14	65.00	30	34.50	16	73.00	34	15.33	7	217.83	100

Project costs by year and by expenditure category are shown in the tables below:

Table 2. Estimated Project Financing by Expenditure category(US\$ million)

Expenditure category	IFAD		GCF loan		GCF grant		Government		Beneficiaries		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Goods, Services, Works, and Grants	30.00	15	65.00	32	34.50	17	59.28	29	15.33	8	204.11	94
Management and Administrative Provision	-	-	-	-	-	-	13.71	100	-	-	13.72	6

Total	30.00	14	65.00	30	34.50	16	73.00	34	15.33	7	217.83	100
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Table 3. Estimated Project Financing by Year (including contingencies, U\$S '000)

Financier	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
IFAD	103	3 661	6 265	7 303	5 750	3 477	2 272	1 170	30 000
GCF Loan	-	11 313	20 328	20 328	13 031	-	-	-	65 000
GCF Grant	198	6 931	6 839	7 040	6 539	6 091	264	599	34 500
BNDES/Government	850	9 049	19 224	21 002	13 687	5 591	2 883	714	73 000
Beneficiaries	-	2 690	4 564	4 564	2 881	635	-	-	15 333
Total	1 150	33 644	57 220	60 236	41 889	15 794	5 418	2 483	217 833

c. Disbursement

148. The GCF and IFAD funds will be deposited in separate designated accounts for each financial instrument in US dollars, opened and maintained by BNDES, exclusively for PCRFP financing. BNDES will open and maintain an operational account in Brazil to process transfers to the States' operational accounts. BNDES counterpart funds will be deposited in the States' operational accounts.
149. States in turn will make payments and transfers to producer organizations or other entities in line with the project's AWPB. Transactions at State level will be recorded in the Management Information System (MIS) by categories of expenses, components, output, activities, subactivities, and financing sources. This financial information from the States will be consolidated and recorded by BNDES in its management information system. The possibility of implementing one common MIS for all project transactions is being further explored.
150. Disbursement procedures and other relevant details will be included in the Letter to the Borrower/Recipient (LttB), which will be prepared by IFAD and shared with the Borrower upon signature of the Financing Agreement. The LttB will address requirements for both IFAD and GCF financing, including the size of the advance allocation of each financing instrument. Subsequent disbursements will be based on the submission of withdrawal applications accompanied by Statement of Expenditures (SoE). BNDES will use the IFAD Client Portal (ICP) to submit withdrawal applications and access real-time financial information of the project. For the states, BNDES may adopt a similar procedure based on advances and successive releases through SoEs, following their institutional financing procedures and the Project's Financial Procedures Manual (see Annex 8).
151. IFAD Disbursement conditions: i) designation of the designated accounts in US dollars and an operational account in Brazilian currency (R\$); ii) appointment / selection of the CPMU financial team; and (iii) IFAD-approved Project Implementation Manual
152. Retroactive financing: The mechanism of retroactive financing will be available only for IFAD funds. IFAD Financing Agreement will define the timeframe and the eligible activities and expenditures eligible under the mechanism.

d. Summary of benefits and economic analysis

153. Assumptions. The profitability indicators are calculated taking into account the outcomes, phasing and expected beneficiaries for each type of activity. Benefits lifetime cycle are calculated for a 20-year period as the project involves the implementation of resilient productive systems and natural resource management activities with both short and long-term results, requiring an extended period for the analysis. Financial and economic discount rates are considered at 10% and justified with the opportunity cost of capital for both the financial and economic perspective (see Annex 4).
154. Financial Analysis. Nine models were developed to simulate impacts for each type of intervention on each targeted group of beneficiaries. For Component 1, six models are proposed. Benefits and savings from bio-digesters and eco-efficient stoves are considered separately. For Component 2, there are three models to illustrate the range of activities that could be developed by the targeted beneficiaries.
155. Overall, the financial analysis shows positive Net Present Values (NPV), Financial Internal Rate of Returns going beyond the cutoff rate and Benefit-Costs ratio higher than 1, so all models are considered profitable, with FIRR rates ranging from 10% to 39% depending on the supported activity, and net present values (NPV) at the 10% discount rate varying from R\$ 2,322 to R\$ 219,941. Annex 4 summarizes the profitability indicators for all the financial models.
156. Economic Analysis. Externalities/additional economic benefits. Two different types of additional economic benefits were included: a) the family savings due to the implementation of eco-efficient stoves, bio-digesters and other proven social technologies; and b) environmental externalities calculated using the Ex-Act tool software to estimate the project's mitigation impact of avoiding CO2 emissions.
157. The EIRR is estimated at 19.77% while the NPV reaches U\$S 152 million (R\$ 684 million). The B/C Ratio is 3.18.
158. Sensitivity Analysis. A sensitivity analysis was carried out assuming different risk scenarios. These include an increase in project

costs (10%, 20% and 50%), a reduction in project benefits (10%, 20% and 50%), delay in project benefits (1 and 2 years) and the occurrence of climate change extreme events (every 2, 3 and 4 years). The project is assumed to be profitable and resilient as it supports most of the tested scenarios. The project would not be profitable in a case of a mixed cost increase of 20% and a benefit reduction up to 30%. Nine sources of benefits are equally contributing to the total project's additional cash flow. This serves to demonstrate that project benefits are well diversified and not highly exposed to price or sectorial risks.

e. Exit Strategy and Sustainability

159. Several elements were built into the design of the project to ensure sustainable outcomes after termination and form the basis for the exit strategy (see Annex 10). A draft Exit Strategy was prepared (Annex 10) and will be used for the preparation of a detailed Exit Strategy in the first year of the PCRP implementation. PCRP main objective is to build resilience of communities and in this regard technical assistance service will be a critical element of the exit strategy. It is expected that the PCRP will lead the way in introducing a new model of intervention for the semiarid of NEB and which could later be up scaled by BNDES itself, federal ministries as well as states and other organizations working in the field as well as other financial organizations both domestic such as the Northeast Bank or international such as IDB, AFD or World Bank. Farmers' organizations and civil society will be important partners, ensuring that the building of capacities is consolidated and disseminated as part of the project's approach. This will entail a new spectrum of capacities will be mainstreamed by the PCRP and adopted by partners. The PCRP is aligned with long-term policies for rural areas of the Brazilian semiarid building on extensive experiences and lessons learned from previous BNDES[43] and IFAD[44]. Ultimately, the Exit Strategy relies on the project's success in improving participants' livelihood, capacities and fostering an enabling environment supportive of climate-resilient agricultural production. To sustain the interventions and scaling up pathways after the end of the project, key elements will be developed and put in place. Considering that the project relies on a set of partners at the local, regional and national levels, which will bring knowledge and experience to the implementation, the Exit Strategy will also benefit from this collaborative effort.

3. Risks

H. Project risks and mitigation measures

160. The project overall **risk is classified as Moderate**. The detailed risks and mitigation measures are included in the Integrated Project Risk Matrix (IPRM - Annex 9). The main risks pertain to i) misalignments between state governments and the federal government; ii) national government change in policies (especially towards climate change) resulting in a misalignment with the project's strategies and objectives; iii) macroeconomic in terms of the need of the states to have domestic borrowing ability in order to have a subloan with BNDES; and iv) financial management due to the complexity of the project's funds structure.
161. The main mitigation measures for the risk are ensuring the design is thoroughly discussed and agreed at both state and federal levels through consultations and dialogue as well as involving key stakeholders. The partnership with BNDES, a national government body directly tied to the Ministry of Economy, is a key mitigation factor as it assures dialogue between federal and state levels. The project's Advisory Committee will promote the integration and alignment with other governmental projects, programs and policies. IFAD previous project collaboration and partnership with BNDES further ensures consistency as BNDES has gained knowledge of IFAD operations. The complexity of the project's financial arrangement will be mitigated by IFAD extra efforts to ensure that legal agreements are prepared, negotiated, and signed timely. One critical aspect for risk mitigation is the project's arrangement for supervision and implementation support and IFAD country presence and solid experience and relationship built over its experience working in northeast Brazil. Finally, the fact the project already has an advanced PIM (Annex 8), which was collectively elaborated, will increase predictability and implementation readiness.
162. The Financial Management risk is included in the table above.

I. Environment and Social category

163. The Project was **categorized as B** following a thorough analysis of the components potential impacts. Anticipated environmental and social impacts that may arise through development and implementation of TRIPs are minimal and related to implementation of climate resilient productive systems (CRPS) – which promote improved soil and water management, reduction of agrochemical uses and ecosystem restoration. Furthermore, the project has developed a gender transformative strategy and action plan, to increase PCRP's impact on gender equality and strengthen women's empowerment by transforming social and cultural norms regarding gender roles. Anticipated technologies have been tried and tested in NEB, providing important improvements in human wellbeing with minimal –and usually reversible– negative impacts.
164. Project SECAP and ESMP ensure: i) all water harvesting and storage investment in Component 2 will be designed to not interfere with ecological water flows or natural drainage of water bodies; ii) treatment and reuse of household grey and black water comply with health and environmental standards including applying required monitoring; iii) a participatory indigenous peoples plan will be developed applying the FPIC principles prior to any intervention; and, iv) adequate monitoring and verification of safeguard compliance is considered throughout project life. No expansion of agricultural land or drilling of wells is expected. In all its activities, compliance will be sought with IFAD's policy to preventing and responding to sexual harassment, sexual exploitation and abuse. For more details see SECAP and ESMP in Annex 05.

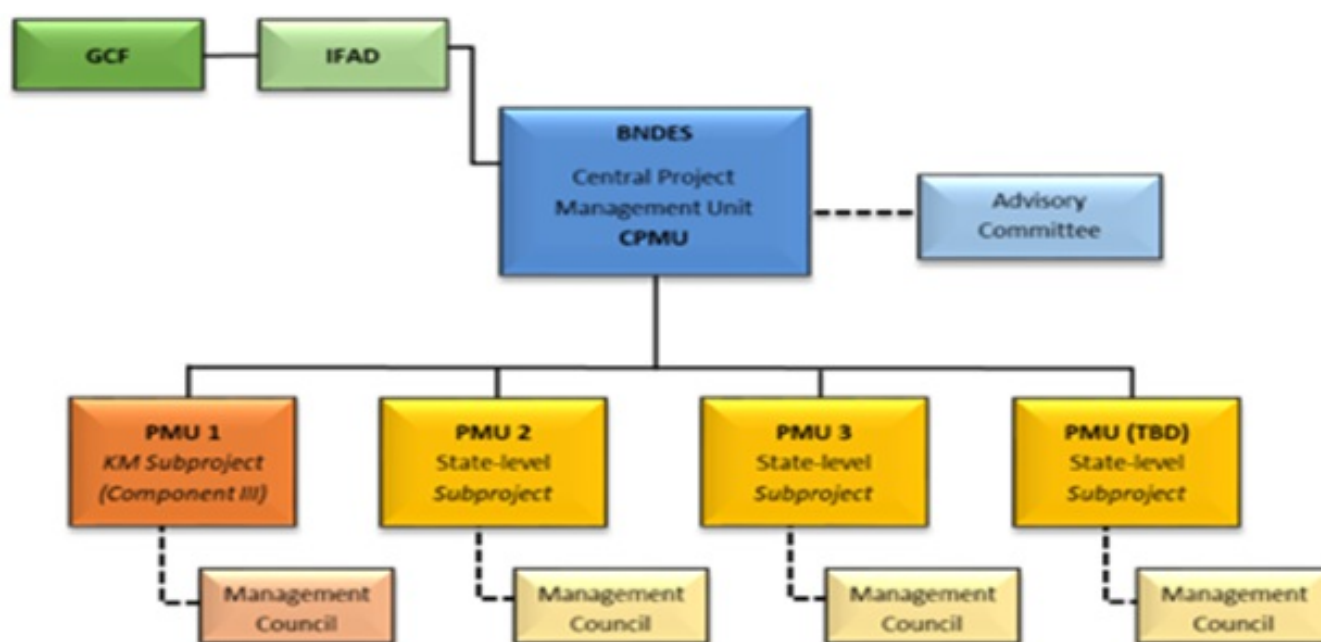
J. Climate Risk classification

165. The project is classified as **"High Climate Risk"**. An analysis of drought events between 1981 and 2016 reveals that drought intensity for the last 36 years has been increasing in NEB, and that recent droughts were more frequent, more severe and affected a larger area with significant impacts for population, as well as economical activities. Approximately 95% of all losses in Brazilian agriculture are due to either floods or droughts. It is estimated that due to climate change, subsistence foods, such as cassava, beans and corn, can suffer productivity losses up to 5% by 2030 in the Northeast.
166. Regional climate simulations for the Northeast region^[45] predict a temperature increase from 0.5 – 2.0°C in the period 2011-2040 compared to a baseline period of 1961-1990^[46]. Current climate models predict the region will experience the highest amount of variability in precipitation in the country, as well as an increase in length of consecutive dry days^[47]. It is expected that the interior – which is already becoming drier – would be more affected than the coastal areas. Despite the rise of precipitation in the summer, the projected annual cycle shows a dominating annual reduction of rainfall in the region. The variability combined with high drought sensitivity and a low adaptive capacity can cause further detriment to the local population.
167. Dry summer months are expected to perceive a moderate increase between 2 and 6°C in NEB^[48]. Impacts are expected to grow exponentially within a range temperature increase of approximately 4.5°C for the period 2041 and 2070, in line with IPCC projections. Intense thermal stress accompanied by moisture-stress can intensify the vegetative drought. This is particularly relevant considering that the current productivity in the semiarid is already low, hence any further losses would threaten food security in the region, with consequent repercussions on both local and national food security. In addition, the expected climate changes may exacerbate other environmental problems that already affect family farming in the semiarid region: animal breeding, wild plant gathering, soil degradation, pests, dissemination of diseases and weeds and desertification.

4. Implementation

K. Organizational Framework

a. Project management and coordination



168. **IFAD.** In its role as cofinancier and recipient of GCFs resources, IFAD will be responsible to carry out project supervision, mid-term review and final review missions. IFAD will also perform implementations support missions, and prior review of all project benchmark documents, as well as main procurement processes and institutional agreements, issuing its no-objection accordingly. IFAD will also be responsible to report to GCF annually on the project's performance. IFAD's office in Salvador will play a critical role in terms of supervision and implementation support.
169. **The Executing Entity (EE)** the Brazilian National Development Bank (BNDES), which is part of the Federal Government of Brazil, will be the project's Executing Entity and the borrower of the loan from IFAD. BNDES will operate the domestic sub-lending to the selected NEB states. BNDES is a public development bank wholly-owned by the Federal Government with legal personality incorporated under Brazilian corporate law. BNDES is an organization linked to the Ministry of Economy. BNDES was accredited to the GCF at the Board Meeting held in July 2019. BNDES has vast experience with lending from multilateral banks such as the World Bank and Inter-American Development Bank (IDB). As sole EE, BNDES will have the final decision

making power on project activities including: i) use of funds; ii) State selection and criteria for project implementation area; iii) criteria to select final beneficiaries; iv) criteria to define eligible practices and interventions; v) criteria for TRIPs approval; vi) requirements to procure TA teams and service providers. BNDES will verify the application of the criteria and requirements and will provide final approval.

170. **The Central Project Management Unit (CPMU).** The CPMU will be housed within BNDES Headquarters (the Executing Entity) to monitor implementation, compile physical and financial information, report to IFAD and be overall accountable for the implementation of the project. The CPMU coordinates sub-projects' implementation by SIUs in line with the PIM (Annex 8), which can be updated as needed with prior IFAD no objection. It also approves the state-level sub-projects' AWPBs, and PACs, as well as analyses and validates TRIPs and Progress Performance Reports. Therefore, the CPMU oversees, evaluates, guides and advises overall project execution. It also has the central role on performing financial management, accounting and financial reporting to IFAD, engages auditors and submits audit reports to IFAD, relative to the activities of the overall Project.
171. **The State-level Implementing Units (SIUs).** A SIU will be established for each state-level subproject, which will be responsible for procurement, financial management, evaluation and monitoring of its own activities, including the analyses and corrections and pre-approvals of TRIPs prepared by the TA teams and its submission for validation by the Consultative Councils and final approval by CPMU. This will be done in line with BNDES guidelines and final decision. Each subproject will implement its subsidiary financing agreement with the BNDES and comply with IFAD policies on financial management, procurement, auditing, monitoring, eligibility, and anticorruption, as well as requirements defined by BNDES in its co-financing policy. The subsidiary financing agreement will mirror the arrangements established in the loan and grant agreement(s) and comply with its provisions. Before granting the no-objection to the subsidiary agreements, IFAD will conduct a financial management assessment of the corresponding SIU to ensure that the appropriate financial management arrangements are in place. Whenever possible, subprojects will build upon pre-existing operational structure of IFAD-supported projects, within the state secretariats responsible for family farming. Each state level SIU will be located in the state government's Secretariat responsible for family farming or rural development and will report to the CPMU. The terms of reference and selection of core SIU staff will be submitted to the CPMU and IFAD for prior review and no-objection, according to the PIM (Annex 8). The selection of support consultants will take place through an open and competitive process, with prior review by IFAD and BNDES.
172. **Planning, Monitoring, Evaluating, and Learning (PMEL) Unit:** The PMEL Unit will be responsible for the implementation of part of Component 3 in line with the PIM and guidance from the CPMU. It will be subcontracted by BNDES through a tender process. It will be headed by a PMEL Manager, approved by BNDES and appointed with no-objection from IFAD. The PMEL implementation will be contracted by the CPMU and it will perform financial management, procurement and contract management; and provide full access to and collaboration with the project auditors; submit requests for no-objections to BNDES, for passing on to IFAD; ensure procurement is compatible with the Project's social and environmental safeguards; submit AWPBs, including procurement plans, and physical and financial progress reports for the subprojects to BNDES; ensure that contractors are familiar with GCF, IFAD and BNDES policies, norms and procedures to: (i) avoid ineligible expenditure and delays in projects implementation; (ii) protect the assets of the project; develop terms of reference and cost estimates, technical specifications and budgets; conduct analysis of quotations, technical and financial proposals; prepare price calculation maps, reports of portfolio, technical and financial evaluation; and manages respective contracts provided for procurement and contracting plan.
173. **Advisory Committee.** It will advise the CPMU on the general direction of project execution and promote the integration and alignment with other government projects, programs and policies, as well as the achievement of the project's expected results. It shall contribute to project efficiency, integration with other programs / policies, and achievement of expected results. It shall be composed of representatives from several agencies of the federal government (thematic federal ministries such as Ministry of Environment and Ministry of Agriculture, Livestock and Food Supply, Ministry of Regional Development, among others), civil society, state-level subprojects, BNDES, and NDA (Ministry of Economy).
174. **Consultative Councils:** the subproject SIUs will establish consultative councils at state level to ensure attainment of objectives, transparency and equity, which, following the practice of the ongoing IFAD-supported projects, will include the participation of beneficiaries and civil society representatives (including I&TP) in addition to representatives from state secretariats. Its main role will be to review state level AWPBs and evaluate and validate TRIPs for the SIU's submission to the CPMU approval. If a TRIP agreement overrides the thresholds established on the procurement sections of the PIM (Annex 8) and the letter to the borrower, the approval process will also require IFAD's no objection.
175. **Legal basis for implementation.** The main legal agreements will be the funding activity agreement between the GCF and IFAD; the loan and grant agreement(s) between IFAD and BNDES; and the subsidiary agreements between BNDES and participating state governments.

b. Financial Management, Procurement and Governance

176. **Financial management (FM).** The CPMU will have the overall responsibility for FM and will be appropriately staffed to exercise this responsibility. The main FM functions will be: (i) consolidate the Annual Work Plan and Budget (AWPB); (ii) consolidate financial information for interim reporting and annual financial statements; (iii) monitor liquidity requirements and prepare and submit withdrawal applications to IFAD; (iv) implement and maintain at central and state level an integrated financial management system or an alternative arrangement acceptable to IFAD; (v) engage with the Supreme Audit Institution (SAI), or private auditing firm hired for this purpose, to carry out annual audits and submit consolidated audit reports to IFAD; and (vi) ensure that overall internal controls are effective and that participating states are in compliance with Subsidiary Agreements, the Project Implementation Manual (PIM) and IFAD procurement and FM procedures and requirements. The SIUs' responsibilities will include: (i) prepare the AWPB; (ii) compile interim reports and annual financial statements; (iii) Implement and maintain the integrated financial management system; (iv) ensure that accounting transactions are promptly and accurately registered, bank reconciliations regularly performed, and relevant documentation orderly retained; (v) collaborate with the auditors and provide full

access to information and documentation; and (vi) ensure that the internal controls are sound and project activities are carried out in compliance with the Subsidiary Agreements, the PIM, and IFAD procurements and FM procedures and requirements.

177. **Budget process:** The CPMU will be responsible for ensuring sufficient resources from all sources of funds are available for the Project. BNDES will consolidate in the overall AWPB budgetary information submitted by each State.
178. **Internal control:** Internal controls will be exercised both at central and state level, ensuring appropriate segregation of duties, accounts reconciliation, the use of sound management information systems, the application of a comprehensive financial manual, the timely implementation of recommendations by external and internal auditors, and the required financial management training for staff.
179. **BNDES and state-level counterpart contributions:** BNDES will make available counterpart funds in the form of loans to States to finance the Project's investment activities. States may choose to take loans from BNDES and/or contribute with their own resources. States counterpart contribution will include in-kind management expenses of SIUs, which will be duly measured and documented.
180. **Beneficiaries' contributions:** These will be in-kind and will require to be duly measured, documented, and registered. The PIM will provide procedures for in-kind contributions in line with IFAD's Technical Note on In-kind Contributions.
181. **Accounting and reporting:** A common integrated financial management system or an acceptable alternative arrangement will be used at the central and state levels (or another arrangement acceptable to IFAD). The system will provide for budgeting, accounting, and reporting in compliance with IFAD requirements, including registration and reporting by source of funding, originating state, component, output, activity and expenditures. The system will handle multiple currencies and include modules for assets and contract management. Interim financial reports will be submitted semiannually in line with IFAD and GCF requirements, which will be described in the PIM. Annual consolidated financial statements will be prepared in accordance with the PIM and with IFAD Handbook for Financial Reporting and Auditing, and will be submitted to IFAD not later than four months after the end of each fiscal year.
182. **External audit:** The project will be audited annually by the SAI, or private auditing firm hired for this purpose, in accordance with international auditing standards. The consolidated annual audit report, including all sources of funding and participating states, will be submitted to IFAD within six months after the end of the fiscal year. The audit will be made available in one of the official IFAD languages.
183. **Procurement.** Procurement of goods, works and services financed by the project will be carried out in accordance with the Procurement Law of the Federative Republic of Brazil (Law n° 8.666, from 1993) and its amendments to the extent that they are consistent with the provisions of IFAD's Project Procurement Guidelines and Handbook and its amendments. According to the World Bank's assessment of the national procurement methods (2010), Brazil complies with international standards in terms of: (a) legislative and regulatory framework; (b) institutional framework and management capacity; (c) procurement operations and market practices; and (d) integrity and transparency of the public systems. Therefore, the project shall use national and state-level procurement systems, applying the rules and procedures established on the current legislation. Nevertheless, national and international bidding processes, as well as all contracts established under the aegis of the project, must always contain IFAD's clauses on Anti-Fraud and Corruption Provisions, as well as Sexual Harassment and Sexual Exploitation and Abuse (SEA). The prior review arrangements, determined by thresholds of the estimated value of the contract and other variables, as well as the phases of each process that require IFAD's non-objection, will be fully detailed in the letter to the borrower and the MIP (Annex 8). Each year, the project will submit for IFAD's approval a procurement plan (PAC) (see Annex 7) as part of the AWPB (see Annex 6), containing a compilation of the procurement planning of each subproject.

L. Planning, M&E, Learning, KM and Communication

a. Planning, M&E, Learning, Knowledge Management and Communication

Background

184. A Planning, Monitoring Evaluation and Learning System (PMEL) will be developed to allow the results-based project management. The data and information collected through the use of specific tools for the implementation of CRPS, will contribute not only to learning, feedback and improvement of project interventions but will also build the foundations for the material relevant to the knowledge management (KM). The PMEL will be a fundamental tool to the CPMU decision making and will be in particular useful to provide feedback to the SIUs at the state level. In addition, the systematization and dissemination of good practices and successful experiences will be important to define and design South-South cooperation schemes, advancing concrete results.
185. The design of the PMEL is based on the experience of practices and methodologies applied in previous IFAD operations in Brazil and in other countries in the region. The planning and monitoring tools will favour participative practices both in their intervention at the level of TRIPs, communities, as well as in the Project management.
186. In order to manage the state level information, the Country-based Monitoring and Evaluation system (DATA-FIDA), developed and implemented for the ongoing IFAD Brazil portfolio will be used and customized for the PCRP. The system has been developed by Programa Semear Internacional (PSI) and all projects in Brazil have been trained on its use. It is a project-supporting tool for organizing the information so that it reflects the implemented activities contribution both to the Logical Framework (LF) (see Annex 1) and to the project AWPB (see Annex 6). Each state-level SIU will carry out the physical and financial monitoring of the implemented activities in its respective state using the DATA-FIDA system and will report to the CPMU to monitor the implementation of the project as a whole. During the first year of project implementation, improvements will be made to the DATA-FIDA system to allow the aggregation of the state data and its handling by the CPMU; in addition, an interface

will be implemented for DATA-FIDA to dialogue with the IT system of BNDES. The CPMU will be responsible for preparing and sending to IFAD the required consolidated progress reports and other project information, based on information provided by the SIUs. IFAD will be responsible for preparing and sending the progress reports to the GCF, in collaboration with BNDES.

187. The LF was developed to be the main management tool for the CPMU to monitor the project performance against targets and to be used to inform both the GCF and IFAD. For this reason, the version presented in the project design report shows a combined result of the GCF and the IFAD methodologies, with the outcomes presented at the beginning of the LF matrix and for the project as a whole, followed by the outputs, activity and subactivity by component.

Focus and objectives

188. The PMEL objective is to generate learning for the project implementation and evidence on the results on changes in the quality of life of vulnerable groups, communities and regions in which the Project will operate. The PMEL system will be developed in a participatory manner including all the actors involved, to promote the ownership of the used instruments and procedures.

Planning

189. It will be undertaken at a strategic and operational level. At the strategic level, the state project authorities' participation will be promoted for a preliminary mapping of the area of intervention in each state. In these selected areas, the participation of SIUs will be important, to initiate the Project actions with the selection of municipalities and beneficiary groups with the highest socioeconomic, climate and environmental vulnerability. The SIUs that will have on board, both an M&E specialist and an analyst, will be responsible for the preliminary mapping of this planning exercise to be aligned with the objectives and goals defined in the ML and the Project design document.
190. At the operational level, the AWPB will be prepared annually by the state-level SIUs defining for each subproject a logical and coherent set of activities that will be carried out each year, which the CPMU will consolidate into a single document. The project's AWPB will be composed of systemic or wide ranging activities such as the proposed in Component 3, as well as those of a territorial nature, limited to the specific realities in the selected states.
191. The AWPB preparation and its implementation will be facilitated by the tools available and under use at IFAD portfolio in Brazil for the financial and physical performance (DATA-FIDA) follow up. The AWPB as a project management instrument will facilitate the monitoring for the fulfilment of the activities, the use of resources and the budget execution, and be a continuous evaluation tool allowing informed and timely decision-making to adjust and/or reschedule the Project at any moment during its implementation.
192. Each state, through its SIU, must participate in the elaboration of its AWPB taking into account the project's final goals. Starting in the second year, the assessment of the results of the previous year will also be considered, to include adjustments in the implementation rates depending on the magnitude of the changes achieved against those projected. The project's consolidated AWPB will be submitted by the CPMU annually for IFAD's no-objection.
193. If necessary, the LF will be revised at the beginning of the project implementation to ensure that expected results and goals will be consistent with its purpose, as well as checking the validity of assumptions and adjusting the verification means.

Monitoring

194. It will ensure the efficient Project performance and the coherence of its physical and financial progress to achieve the planned results. To this end, specific tools will be designed to aggregate data from subprojects and participatory community exercises. These tools will be applied consistently for all the participating states, for which their development and changes throughout the project life must be carried out with leadership by and in agreement with the CPMU. Complementary, a georeferenced GIS-based monitoring system will be implemented, which will be managed by each state-level SIU, to determine the degree of recovery of the project's intervention areas through GIS-based monitoring studies of vegetation cover and ecological quality in addition to the monitoring of rainfall and temperatures. The adoption of this methodology will make it possible to assess resilience improvements during project implementation and to calculate carbon mitigation. The GIS-based monitoring can also improve the understanding of factors contributing to resilience by overlapping the recovery data, climate data (rainfall and temperatures) with the index for resilience capacities of farming families.
195. In order to monitor changes in the resilience capacities of farming families, a particular feature of the monitoring of the Project impacts, a resilience scorecard and index (see Appendix of Annex 8 - PIM) have been developed tailored to the project's theory of change (see Annex 2 for TOC). This methodology has a pragmatic approach to dealing with multi-factor complexity. It only focuses on monitoring the resilience capacities the project seeks to address or is likely to influence. It does not monitor absolute resilience, but changes in resilience of the beneficiaries compared to the baseline or control group families. The resilience questionnaire and scorecard may be adjusted in consultation with project stakeholders at project start-up and will be completed as part of the baseline survey, at mid-term and at the end of the project. It should be used for knowledge generation and improved analysis of resilience dynamics by combining it with the GIS-based monitoring studies of vegetation cover and ecological quality and climate data showing if stresses or extreme weather events have occurred during the implementation of the project.
196. In addition, based on the positive experience of IFAD-supported projects in Brazil, the use of "cadernetas agroecológicas" or agroecological logbooks will be expanded and promoted. This will help to capture the (economic and financial) contribution women make to their households and to identify and address gender inequalities that play out at the household level.
197. The monitoring must provide timely and reliable information, both at central and state level, on the fulfilment of projected activities

in the AWPB, the obtained achievements and the use of the financial resources, with the aim to take decisions at the community, state and project levels and make possible the needed corrections and reorientations during its implementation. For the monitoring of TRIPs, tools that have already been proved in other states with other IFAD projects in Brazil will be adapted to be applied to the PCRP activities. The project monitoring system will be consistent with the LF.

198. To carry out the monitoring throughout the project cycle, the state-level SIUs will collect information on the activity and output levels from the beginning of the implementation period, and on outcomes in the form of short questionnaires with a randomly selected subgroup of beneficiaries annually as of the Mid-term Review. These data will be entered into the DATA-FIDA system in a decentralized manner, and checked for consistency by the CPMU. The decentralized data entry is expected to engender local ownership of the data and local progress stocktaking relative to the AWPB and to the TRIPs. In addition, specialized thematic studies will be contracted by the SIUs as part of Component 3. The CPMU will have an advisory function to guide these services. The CPMU will also be responsible for the development and implementation of new (planning, monitoring, and evaluation) complementing tools deemed necessary along the project life, in coordination with the responsables for the M&E areas of the SIUs.
199. On the SIU side, it is expected that the development and implementation of the monitoring subsystem will be carried out through the M&E specialists and analysts designated for the project in each participating state. They will require specific training in activities related to DATA-FIDA, the GIS information system management and maintenance, the use of satellite information, georeferencing, etc

Evaluation

200. Evaluation implies an analysis carried out at different moments with diverse scopes and depths, mainly focused on the effects and outcomes of the project, with less emphasis on the implementation of activities or immediate outputs. The project must have a clear evaluation strategy that allows evaluating its contribution to the achievement of the results and impacts defined in the LF. This strategy will be defined at the project's start-up to ensure that the needed information will be collected through the execution. In this sense, the evaluation subsystem will be closely linked to and partly fed by the monitoring subsystem. The evaluation strategy will be developed around three key moments and studies: the baseline study, the mid-term review and the final report (including the results of the impact evaluation study).
201. **Baseline study.** Its objective is to describe and analyse the initial situation of the project's target group based on selected indicators of impact and effect related to the Project's expected outcomes in its LF. It will serve as a benchmark for comparison for future evaluations. To this effect, specialized services will be hired to collect needed information for the project activities and in line with the objectives and results to be achieved and that are found in the LF. The baseline survey will be conducted under Component 3 in a consolidated manner for each specific state. The terms of reference for this contracting, as well as the sampling, shall be elaborated jointly and agreed with the CPMU. Previous experience with the grant Adapting Knowledge for Sustainable Agriculture and Access To Market (AKSAAM) with the Federal University of Viçosa (UFV), the Programa Semear Internacional (PSI) grant and other experiences such as with the International Policy Centre for Inclusive Growth (IPC-IG) will be taken into account. The data survey in each one of the states must follow the same methodology. The proposed methodology and the sample must have the IFAD's no-objection. The CPMU will be responsible for overseeing the implementation of the baseline study.
202. **Mid-term Review (MTR).** BNDES and IFAD will carry out an MTR by the end of the fifth year of project execution (the date will depend on the state-level of execution of the Project and its total duration). The MTR will be carried out once a contracted survey on the results of the project is finalized, which will present the first advances in terms of outcome indicators. This survey will be carried out with information collected from each of the participating states. The minimum content of the aspects to be considered in the document will be jointly defined by the CPMU and IFAD. This review will also analyze the implementation process and the relevance of the intervention strategies and methodology. The mid-term review report will serve to adjust the orientation of the project.
203. **Impact Evaluation.** The final evaluation will be carried out during the last year (year 8) of project execution, by contracting specialized services in the same way as the baseline and the MTR surveys. For the survey, a methodology will be defined (including the sample design) to be consistent with that applied for the baseline of the Project, in order to make an objective comparison of the progress of implementation and adequate measurement of its impact and results. The proposed methodology and sample must have the IFAD's no-objection. The results of this study will provide inputs for the Project Completion Report (PCR). Previous experiences of collaboration in the area of evaluation, especially of previous evaluation carried out by IFAD projects and methodologies developed through the AKSAAM grant with the UFV, PSI and IPC-IG will be taken into account.
204. **Project Completion Report (PCR).** This report will describe the situation at the end of the intervention and will include a description of it, the results achieved in relation to the goals set in the LF and the lessons learned. The report will be prepared based on the results and impact study described above, between the completion date and before the closing date of the loan. The report is a project responsibility and will therefore be prepared by CPMU/BNDES following IFAD's guidelines. IFAD will be responsible for sending the PCR to the GCF, which will be carried out in collaboration with BNDES.
205. Thematic evaluations on issues such as gender, youth and nutrition and economic results surveys and studies will also be carried out throughout the project execution period, which will serve to analyze the progress of the project and to review its activities. By their nature, these evaluations will be part of the Learning and Knowledge Management subsystem. The Pro-WEAI will be included in the baseline, mid-term and endline surveys.

Learning and knowledge management

206. Learning and knowledge management (KM) will be carried out throughout the execution, based on the results of the M&E subsystems, where the lessons learned become inputs to adapt planning and monitoring. Due to the importance of these activities, which are more fully described in component 3, each state will have two specialists in communication and KM.

207. The Project will also have specific learning and KM activities. The learning products that will be developed as a basis for these activities may be identified in events related to M&E or others, these could be: thematic and methodological systematizations; technical learning notes; technical training; case studies, good practices, horizontal exchanges and exchanges between institutions and communities
208. The promotion of learning will be done at the community, territory, state, and regional (Northeast) levels, as well as internationally for the benefit of the implementation of PCRP in the targeted area. To this end, the CPMU together with the SIUs will develop a communication strategy that considers the different audiences to which the information will be directed and the various communication objectives. It will be crucial to exchange information and experiences with initiatives of a similar nature in other countries, for which reason the Project will place great emphasis on South-South and Triangular Cooperation (SSTC) activities.
209. Experiences and best practices of previous and ongoing projects in Brazil will be fully considered in order to enhance learning and KM. In this regard, the Dryland Adaptation Knowledge Initiative (DAKI) grant effective since July 2020 will pave the way for cross-cutting activities in learning and KM, SSTC, policy dialogue and M&E. The experiences developed through AKSAAM and PSI grant will also be considered under Component 3 of the PCRP.

b. Innovation and scaling up

210. This is the first IFAD project in Brazil that primarily tackles climate adaptation issues. The innovative aspect is the production system proposed and designed to increase water retention in the soil. Complex agroforestry systems, such as the CRPS, have often been used as a mitigation strategy, not until recently have the benefits of these systems been accrued towards adaptation. Even less so in drylands. CRPS in the semiarid will ameliorate microclimate reducing impact of extreme weather events on crop production, maintain quality & quantity of forage reducing livestock stress, provide greater habitat diversity to support organisms (e.g. native pollinators & useful insects), and create diversified production opportunities to reduce risk under fluctuating climate providing several pathways to securing food for poor farmers, while contributing to climate change mitigation.
211. To ensure the system has enough water during the first few years, when CRPS are more vulnerable, proven water harvesting and storage technologies were incorporated. These technologies were selected from lessons learned during the emergency activities in IFAD-supported projects as a response to the 2011-2017 prolonged drought. The PCRP includes innovative, simple and low maintenance systems to store and reuse water which will allow significant diversification of vegetables, fruit, medicinal plants, and fodder production. Also includes eco-efficient stoves and biodigestors, normally managed by women, which will save time and resources.
212. The project will promote knowledge exchanges and young communicator networks inspired by popular education that will propagate successful experiences and foster innovation. Initiatives will be compiled in a database, a web portal and a set of materials that provide good practices for fostering climate resilience throughout the NEB region. The SSTC activities can take the best practices proven in the PCRP to reach other farmers from other drylands in Latin America (e.g., Gran Chaco, Central American Dry Corridor) and Africa.
213. Another innovative feature of the project is its governance architecture. Channeling resources through BNDES to the participating states will allow higher levels of efficiency and effectiveness in the implementation of project activities. This mechanism reduces the transaction risk that the fluctuations of the state debt indicators imply to allow direct access to IFAD resources by the states, with the guarantee of the Brazilian federal government. In addition, BNDES is a strategic partner whose commitment and experiences will add value to the entire project cycle and maximize the attainment of project goals. BNDES has national influence and capacity to mobilize resources, disseminate lessons learned to other programs and include CRPS projects in its lending portfolio. BNDES can apply lessons learned from the project to its credit lines to farmers in other Brazilian biomes, enabling replication on national scale. BNDES also has the means to encourage rural entrepreneurs to provide tools and services beyond the Semiarid, a potential market of over 4 million family farmers (about 16 million beneficiaries).

M. Implementation plans

a. Supervision, Mid-term Review and Completion plans.

214. Time-line and milestones towards project approval and project start-up

- IFAD – submission of Funding Proposal for GCF: 09 April 2020
- IFAD - Design Review Meeting (DRM): 02 June 2020
- GCF Secretariat approval of Funding Proposal (FP): 12 August 2020
- IFAD Due Diligence on BNDES: 30 August 2020
- GCF Independent Technical Advisory Panel (ITAP) approval: 24 September 2020
- IFAD - Quality Assurance Group Review: October 2020
- IFAD - Submission of IFAD President's Report to SEC: October 2020
- Loan negotiations (based on the conditions established in the Funded Activity Agreement template - FAA): end-November 2020
- GCF Board Approval: November 2020
- IFAD Executive Board approval: December 2020
- Brazilian Federal Congressional Approval: May/July 2021
- Signing Financing Agreement: August/September 2021
- Establishment of PCMU at BNDES: September 2021
- Definition of Subprojects in States: October 2021
- BNDES signs sub-lending contracts with states: October 2021

- Establishment of state-level SIUs: November 2021
- Implementation support mission: BNDES HQ and States: November 2021
- Start-up state workshops: December 2021

215. **Stakeholder consultations and feedback:** The design missions carried out various consultations at different levels: with the Federal Government including the Ministry of Economy, Ministry of Environment, Ministry of Agriculture, Livestock and Food Supply, Ministry of Citizenship, Ministry of Science and Technology, Ministry of Integration, and Ministry of Foreign Affairs; State Level: at various instances state-level authorities were consulted at Governor level and Secretary Level including at the Consortium of State Governors (Consórcio Nordeste), which also visited IFAD HQ with a delegation of 8 NEB Governors in November 2019, and the Forum of State Secretaries where the project was presented in several occasions; civil society: a specific civil society consultation was held on 18 October 2018 in Recife with more than 120 participants; and an indigenous consultation was held on 09 May 2019 in Salvador. Details of the civil society consultation and indigenous consultation is contained in Working Paper – Stakeholder Engagement Plan.

216. **Implementation Readiness:** The project will capitalize on the experience of the previous and ongoing IFAD portfolio and consolidated experience with project implementation at state level. This gave IFAD solid experience on processes and bottlenecks, which can be applied to avoid project delays and to speed up project start-up (see section on Lessons Learnt above). In addition, IFAD grants will pave the way for implementation. In this regard, the IFAD grant Dryland Adaptation Knowledge Initiative (DAKI) will play a critical role to prepare the project for implementation as well as other grants such as PSI and AKSAAM. The PCRP will also utilize the existing capacity of the states and their teams as they have developed ample knowledge of IFAD operations. This will be a central element in ensuring implementation readiness and will also ensure quality of implementation. In addition, the IFAD-financed federal Policy Coordination and Dialogue for Reducing Poverty and Inequalities in Semiarid North east Brazil Project - Dom Helder Camara Project (PDHC phase II) and its operations of technical assistance through the National Rural Extension Agency (ANATER) and implementation of activities in partnership with other federal Ministries, research institutions such as EMBRAPA and universities such as the University of Brasilia (UnB) will ensure the PCRP will count on an extensive network of partners at national level.

b. Supervision, Mid-term Review and Completion plans

217. **Supervision, Mid-term Review and Completion plans** The PCRP will be under the direct supervision of IFAD. IFAD's office in Salvador will play a key role in supervision missions. In order to facilitate the project's implementation and ensure the achievement of project objectives considering the complexity of the multi-state operation and the vast area the project comprises, IFAD in collaboration with BNDES, will conduct one dedicated partial supervision mission per year to each state level subproject and one supervision mission to the CPMU at BNDES HQ which will also include Component 3. The reports (Memorandum) of each of the state level subprojects partial supervision mission will then form the basis of a consolidated supervision report, which will be produced during the annual supervision to the CPMU at BNDES HQ. The final consolidated supervision report will then form the basis for ORMS. The subproject partial supervision mission will contain field visits and dialogue with state-level authorities and stakeholders (civil society, farmers' organizations, decentralized EMBRAPA units, universities, private sector, etc.) and will build on the successful experience of the current state-level supervision scheme successfully implemented by IFAD's office in Salvador for state and federal level projects.

218. **Specific project implementation support missions (ISMs)** to deal with implementation issues will be critical to ensure targeted support by IFAD and removal of possible obstacles. ISMs will be organized for each state-level subproject and the Central PMU, when necessary and according to demands on specific issues. It is expected that at least one ISM will be held to each state-level subproject and one to the CPMU per year.

219. **A mid-term review (MTR)** will be carried out during the fifth year of the PCRP. The MTR will recommend a scaling-up or reorientation as may be required to achieve project objectives.

220. **A completion review** will be conducted jointly by IFAD and BNDES at the end of the implementation period during year 8. It will support the CPMU in the preparation of the Project Completion Report (PCR), and evaluate, among other things, the results and impact of the project, review sustainability and exit arrangement, and draw experiences and lessons for subsequent IFAD and BNDES and state and federal level government supported projects (see above section on Planning, Monitoring Evaluation and Learning System (PMEL) for more details).

Footnotes

- [1] In the case of Maranhão, which currently has 6 municipalities in the semiarid, it will also consider Bill (Projeto de Lei) no; 2492/2019 which enlarges the semiarid of Maranhão to additional 44 municipalities. <https://www25.senado.leg.br/web/atividade/materias/-/materia/136472>
- [2] PNUD; IPEA; PINHEIRO, F. J. **Atlas do Desenvolvimento Humano no Brasil - 2010**. Brasília: PNUD, 2013. Available at: <http://www.atlasbrasil.org.br/2013/>.
- [3] PNUD; IPEA; PINHEIRO, F. J. **Atlas do Desenvolvimento Humano no Brasil - 2010**. Brasília: PNUD, 2013. Available at: <http://www.atlasbrasil.org.br/2013/>.
- [4] The criteria to define poverty and extreme poverty in Brazil are the following: Extremely poor: with a monthly per capita household income of less than 1/8 of the minimum wage, or less than R\$63, according to the 2010 Demographic Census. Poor: with a monthly per capita household income of 1/8 to 1/4 of the minimum wage, or R\$63–R\$127. These figures refer to the value of the minimum wage of R\$510 in effect in 2010, when the last national Demographic Census was conducted. Demographic Census /IBGE.
- [5] ROSSI, J. L. **Development Challenges in Brazil** - IDB Policy Brief 282. Brasília: Inter-American Development Bank, 2018.
- [6] IBGE (2017). Pesquisa Nacional por Amostra de Domicílios Contínua (PNAD). Available at: <https://www.ibge.gov.br/estatisticas/sociais/habitacao/17270-pnad-continua.html?=&t=o-que-e>.
- [7] NERI, M. **Qual foi o Impacto da Crise sobre a Pobreza e a Distribuição de Renda?** Rio de Janeiro: Fundação Getúlio Vargas, 2018. Available at: https://www.cps.fgv.br/cps/bd/docs/NOTA-CURTA-Pobreza-Desigualdade-a-Crise-Recente_FGV_Social_Neri.pdf.
- [8] PRONAF was founded in 1995 to address this problem and to stimulate agricultural production amongst the poor, by extending access to financial services. More details can be found on the following IFAD commissioned study on public policies for family farming in Brazil (see page 20): https://ipcig.org/pub/eng/WP142_Public_policies_for_rural_development.pdf
- [9] For example, in family farming policies alone, the budget was reduced from R\$ 7 billion to R\$ 5.8 billion from 2018 to 2019.
- [10] BURNEY, J. et al. Climate change adaptation strategies for smallholder farmers in the Brazilian Sertão. **Climatic Change**, v. 126, n. 1 – 2, pp. 45 - 59, 2014.
- [11] A study on the São Francisco Sertão Territory, in Bahia State, shows that 90.7% of all agricultural production units are family farms (Articulação Nacional de Agroecologia. **Desenvolvimento rural sustentável e agroecologia no Sertão do São Francisco baiano: contribuição das redes territoriais e do Projeto Ecoforte**. Unpublished document, 2018). In the Chapada do Vale do Itaim Territory of the Sertão in Piauí State, this percentage reaches 92.7%. (SIDERSKY, P. **Sobre a cadeia produtiva da caprinovinocultura no Sertão do Piauí: um estudo centrado no Território da Chapada do Vale do Itaim [região de Paulistana]**. Salvador: SEMEAR-FIDA-IICA, 2017. 106 p.. Available at: <http://www.fida.org.br/assets/downloads/Estudo%20de%20caso%20sobre%20caprinovinocultura%20-%20região%20C3%A3o%20de%20Paulistana,%20Piauí%20C3%AD.pdf>).
- [12] GUANZIROLI, C. E.; DI SABBATO, A. ; VIDAL, M. DE F. **Agricultura familiar no Nordeste: uma análise comparativa entre dois censos agropecuários**. Fortaleza: Banco do Nordeste do Brasil, 172 p., 2011
- [13] Using data from the 2006 Census of Agriculture conducted by the Brazilian Institute for Geography and Statistics (IBGE), a study of the São Francisco Sertão Territory in Bahia State showed that 62% of the farms and ranches in this Territory cover between 0 and 20 hectares.
- [14] Studies show that families add together a variety of sources in order to constitute total family incomes. But even for families leaning heavily on agricultural output, this never outstrips the weight of livestock production in terms of gross value produced. (HOLANDA JR., E. V. et al. **Tipologia e estrutura da renda de caprino-ovinopecultores de base familiar no Sertão Baiano do São Francisco**. VI Encontro da Sociedade Brasileira de Sistemas de Produção, 2004. Aracaju, SE. Sociedade Brasileira de Sistemas de Produção, 20 a 22 de outubro de 2004).
- [15] Several species of fodder cactuses imported from Mexico were introduced into the semiarid region. The most common are: *Nopalea cochenillifera* Salm-Dyck and *Opuntia ficus-indica* Mill.
- [16] YOUNG, C.E. et al. **Drought in the Brazilian Semi-Arid**. Study commissioned by IFAD (please see Annex 23).
- [17] GUTIÉRREZ, A. P. et al. Drought preparedness in Brazil. **Weather and Climate Extremes**, v. 3, p. 95 - 106, 2014. Available at: https://www.researchgate.net/publication/262922408_Drought_preparedness_in_Brazil.
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- [19] BRASIL-MAPA. **Informativo sobre a Estiagem no Nordeste - nº 113 - 31/10/2017**. Brasília: Ministério da Agricultura, Pecuária e Abastecimento, 2017. Available at: <http://www.agricultura.gov.br/assuntos/politica-agricola/combate-a-seca-1/arquivos-combate-a-seca/113.pdf>.
- [20] MADEIRO, C. 2013. **Seca fez Nordeste perder 4 milhões de animais em 2012, diz IBGE** Available at: <https://economia.uol.com.br/agronegocio/noticias/redacao/2013/10/15/seca-fez-nordeste-perder-4-milhoes-de-animais-em-2012-diz-ibge.htm?cmpid=copiaecola>.

- [21] VIDAL, M. D. F. Efeitos da seca de 2012 sobre a apicultura nordestina. **Informe Rural**, v. 7, n. 2. Available at: https://www.bnb.gov.br/documents/88765/89729/%20ire_ano7_n2.pdf/7a9e8843-0f57-4ed8-b737-0a6096c915cd, 2013
- [22] The National Health Surveillance Agency (ANVISA), linked to the Ministry of Health and corresponding state agencies, has strict standards. Animal products, including honey, must comply with federal standards as defined in the Federal Inspection System (SIF). There are also State Inspection Systems (SIE) and Municipal Inspection Systems (SIM), and an attempt to integrate them into a single system of attention to agricultural health standards (SUASA).
- [23] RDC No. 49/2013, in which there is a guideline that aims to "protect artisanal production in order to preserve traditional customs, habits and knowledge, in the perspective of multiculturalism of peoples, traditional communities and family farmers."
- [24] https://www.mds.gov.br/webarquivos/arquivo/cadastro_unico/_Diversidade%20no%20Cadastro%20Unico%20-%202014.pdf
- [25] <https://journals.openedition.org/aa/4938>
- [26] The land structure in the semiarid of NEB is mainly made of family farmers out of which 77% have property sizes between 1 and 20 hectares, while 94% have properties of size less than 100 hectares. On average, about 4 hectares are used for land cultivation per property in the region, mainly for subsistence farming of maize and beans, and 35 hectares for forage and animal feeding, mainly for small ruminants.
- [24] https://www.mds.gov.br/webarquivos/arquivo/cadastro_unico/_Diversidade%20no%20Cadastro%20Unico%20-%202014.pdf
- [25] <https://journals.openedition.org/aa/4938>
- [26] The land structure in the semiarid of NEB is mainly made of family farmers out of which 77% have property sizes between 1 and 20 hectares, while 94% have properties of size less than 100 hectares. On average, about 4 hectares are used for land cultivation per property in the region, mainly for subsistence farming of maize and beans, and 35 hectares for forage and animal feeding, mainly for small ruminants.
- [27] In the case of Maranhão, which currently has 6 municipalities in the semiarid, it will also consider Bill (Projeto de Lei) no: 2492/2019 which enlarges the semiarid of Maranhão to additional 44 municipalities. <https://www25.senado.leg.br/web/atividade/materias/-/materia/136472>
- [28] For further information on the tools for municipal ranking see Annex 8, PIM section 5.2.
- [29] Cadúnico was launched in 2001 and is the federal data based for people living in extreme poverty and poverty in Brazil and registration on the data-based is a prerequisite for accessing social inclusion programs such as *Bolsa Família*. Are allowed to register under Cadúnico: (i) families with monthly income of up to half a minimum wage per person; (ii) families with monthly total income of up to three minimum wages, provided that register is linked to the inclusion in social programs from the three governmental levels.
- [30] According to law nº 11.326/2004, family farmers are defined by 4 criteria: (i) they have up to 4 fiscal modules; (ii) they have a minimum family income from rural economic activities in their establishment and/or enterprise; (iii) they predominantly use their own family labor in rural economic activities; and (iv) they run their establishment or enterprise with their family. In addition to this definition the PCRFP also includes traditional and indigenous small farmers producing community based.
- [31] See details on the FPIC processes to be applied in the Indigenous Peoples Planning Framework Appendix 1 of the SECAP Annex 05.
- [32] Seeds, seedlings, fertilizers, equipment rental or purchase, irrigation systems, tools, fences, etc.
- [33] TDS – Total dissolved solids.
- [34] MME-CPRM-SERVIÇO-GEOLÓGICO-DO-BRASIL. **Projeto Cadastro da Infra-Estrutura Hídrica do Nordeste. Relatório Preliminar - 1ª Etapa - 225.000 km² - Versão Beta**. Brasília: MME-CPRM-Serviço-Geológico-do-Brasil. Available at: https://www.cprm.gov.br/publique/media/hidrologia/m_apas_publicacoes/cadastramento_fontes_semiarido_brasileiro.pdf. 2003.
- [35] Hoffman and Shannon, 1985
- [36] According to Brazilian Law, "microenterprise" is defined as a company with annual gross revenue of less than R\$ 360,000.
- [37] The same technique has been used for construction of cisterns in the One Million Cisterns Program.
- [38] Cisterna Calçadão - Instruction regulated by Law number 12.873, dated October 24, 2013. Decree number 8.038 of July 4, 2013 and Ordinance number 130 of November 14, 2013.
- [39] Instruction regulated by Law 12,873 of 24 October 2013, Decree number 8,038, of 4 July 2013 and Ordinance number 130, of 14 November 2013
- [40] Instituto Trata Brasil, see: <http://www.tratabrasil.org.br/saneamento/principais-estatisticas/no-brasil/esgoto>
- [41] The World Bank, June 2017. Brazil's INDC Restoration and Reforestation Target, Analysis of INDC Land-use Targets. Report No. AUS19554.

[42] As per the [MDB Methodologies for Tracking Climate Adaptation and Mitigation Finance](#)

[43] BNDES's Social Fund is currently investing in family farming development programs in seven Northeast states and has already funded 24,000 cisterns and 3300 social technologies for agroecological production in the region. In addition, BNDES has built vast experience on the environmental areas by being the executing agency of the Amazon Fund.

[44] IFAD is currently implementing 6 projects supporting the productive structuring of family farming and social water-access technologies, covering 11 states, 9 of which are located in NEB and out of which 5 are state-based projects. For more details on IFAD lessons learnt, see PDR, section B – Lessons Learnt.

[45] HadGEM2-ES and MIROC5 for two RCP scenarios—8.5 and 4.5

[46] Chou, SC; et.al. Assessment of Climate Change over South America under RCP 4.5 and 8.5 Downscaling Scenarios. American Journal of Climate Change, v. 03, p. 512-527, 2014.

[47] LACERDA, F. F.; et.al. Long-term Temperature and Rainfall Trends over Northeast Brazil and Cape Verde. **Journal of Earth Science & Climatic Change**, v. 6, n. 8, p. 296, 2015.

[48] INPE. 2015. "Cenários de Mudanças Climáticas: Regionalização." Unpublished. São José dos Campos: Instituto Nacional de Pesquisas Espaciais.

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex 1: Logframe

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

Planting climate resilience in rural communities of the Northeast Project

Logical Framework

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Outreach Number of persons receiving services promoted or supported by the project	1 Persons receiving services promoted or supported by the project				Project M&E system	Half-yearly	Central Project Management Unit (CPMU)	Macroeconomic stability - no changes in national policies
	Females	0	160000	400000				
	Young	0	200000	500000				
	Total number of persons receiving services	0	400000	1000000				
	1.a Corresponding number of households reached				Project M&E system	Half-yearly	Central Project Management Unit (CPMU)	
	Households	0	150000	375000				
	CI 1.b Estimated corresponding total number of households members				Project M&E system	Half-yearly	Central Project Management Unit (CPMU)	
	Females	0	240000	560000				
	Young	0	300000	500000				
	Total number of households members	0	600000	1500000				
	CI 4.2.1. Rural HH satisfied with project-supported services				Project M&E system	Half-yearly	Central Project Management Unit (CPMU)	
	Households	0	120000	300000				
	Percentage of participating households registered in the Cadastro Único by the end of the project				Project M&E system	Half-yearly	Central Project Management Unit (CPMU)	
	Households	0	75	75				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Project Goal Contribute to increasing food, water security and rural family income by implementing climate resilient farming systems and increasing the carbon sequestration	GCF CI A 2.2 Number of food secure households (in areas/periods at risk of climate change impacts)				Resilience Model scorecard Project evaluation according to baseline study and completion (including RIMS/CI survey)	At baseline, mid-term and completion	CPMU with data collected by Project Management Units (PMUs) at state level	Macroeconomic stability - no changes in national policies
	Number of food secure households	0	21440	53600				
	CI 1.2.3 Rural HH that report a reduction in the water shortfall in relation to the production requirements				Tracking of funded TRIPs, and completion study.	Annual	CPMU with data collected by Project Management Units (PMUs) at state level	
	Households	0	11520	28800				
Development Objective Transform family farmers 'productive systems in the semiarid region by increasing production while simultaneously improve their resilient capacity to climate change ate change	CI 3.1.4 Number of hectares of land brought under climate-resilient management				Tracking of funded TRIPs, and completion study.	Mid-term and completion.	CPMU with data collected by Project Management Units (PMUs) at state level	Macroeconomic stability - no changes in national policies
	Hectares of land	0	33650	84124				
	3.2.1 Greenhouse gas emissions (CO2) avoided and/or sequestered				Carbon emission measurements will take place using GIS	Mid-term and completion.	CPMU with data collected by Project Management Units (PMUs) at state level	
	Number of tons	0	-2.3	-4.6				
	CI 4.2.2. Rural HH reporting they can influence decision-making of local authorities and project-supported service providers				Impact /results survey	At baseline, mid-term and completion	CPMU with data collected by Project Management Units (PMUs) at state level	
	Households	0	15000	37500				
	Percentage of participating households that have improved their climate resilience				Resilience scorecard	At baseline, mid-term & completion	CPMU with data collected by Project Management Units (PMUs) at state level	
	Households	0	50	75				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Outcome A 1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions (GCF CI A1.0)	Families benefited by CRPS at Household level				Tracking of Project M&E System.	Annual	PMUs	Timely signature of agreements with state governments
	Families led by women	0	10720	26800				
	Families	0	26800	67000				
	Families benefited by Collective Resilient Investments				Pro-WEAI index at baseline and evaluation	Annual	CPMU	
	Families benefited	0	41200	103000				
	CI IE.2.1. Percentage of individuals demonstrating an improvement in empowerment				Pro-WEAI index at baseline and evaluation	Project completion	CPMU	
	Percentage of individual	0	0	0				
Outcome 2.0 Dietary patterns, nutrition and food security of households improved	CI 1.2.8Percentage of women reporting minimum dietary diversity (MDD-W)				Impact survey	Project completion	CPMU	At least 75% of people that participate in nutrition sensitive training and activities will improve diets.
	Females	0	0	75				
	CI 1.1.8 Number of persons provided with targeted support to improve their nutrition				Project M&E system	Half-yearly	PMUs	
	Females	0	40	40				
	Young	0	50	50				
	Persons	0	57600	144000				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Output 1.1: Areas of intervention selected based in eligible criteria	Territorial Resilience Investment Plans (TRIPs) finalized				Tracking of funded TRIPs, and completion study.	Half-yearly	Project Management Units (PMUs) at state level	Alignment between national government policies towards climate change and the project's strategies and objectives/ Potential beneficiaries interested and aware of productive problems of climate-related crisis / Beneficiary communities participation in TRIPs development
	Plans	0	575	575				
Output 1.2: Backyard Gardens developed	Families that have established backyard gardens using CRPS				Tracking of ISA Quintais		Project Management Units (PMUs) at state level	Alignment between national government policies towards climate change and the project's strategies and objectives/ Potential beneficiaries interested and aware of productive problems of climate-related crisis / Beneficiary communities participation in TRIPs development
	Families	0	14000	36000				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Output 1.3: Climate Information System put in place	3.1.2 Persons provided with climate information services				Tracking of PMAS system and supervision missions.		Project Management Units (PMUs) at state level	Alignment between national government policies towards climate change and the project's strategies and objectives/ Potential beneficiaries interested and aware of productive problems of climate-related crisis / Beneficiary communities participation in TRIPs development
	Persons provided with climate information services	0	49600	124000				
Output 1.4: Farmers and entrepreneurs supported	CI 1.1.4 Persons trained in production practices and/or technologies				Tracking of PMAS system and supervision missions.		Project Management Units (PMUs) at state level	Alignment between national government policies towards climate change and the project's strategies and objectives/ Potential beneficiaries interested and aware of productive problems of climate-related crisis / Beneficiary communities participation in TRIPs development
	Females	0	3840	9600				
	Young	0	4800	12000				
	Persons trained	0	9600	24000				
	Microenterprises funded to develop skills to supply CRPS				Tracking of PMAS system and supervision missions.		Project Management Units (PMUs) at state level	
	Microenterprises	0	28	70				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Output 2.1: Efficient practices of water capture, harvesting, storing and use disseminated	1.1.2 Farmland under water-related infrastructure constructed/rehabilitated				Tracking of PMAS system and supervision missions.	Half-yearly	Project Management Units (PMUs) at state level	Timely signature of agreements with state governments / Promotion and implementation of diversified investment plans, combining productive interventions, water access and non-agricultural activities
	Hectares of land	0	1800	4500				
Output 2.2: Water access technologies for harvesting, reuse, treatment and storage	Number of families that have installed rainwater harvesting and storage				Tracking of PMAS system and supervision missions.	Half-yearly	Project Management Units (PMUs) at state level	Timely signature of agreements with state governments / Promotion and implementation of diversified investment plans, combining productive interventions, water access and non-agricultural activities
	Families	0	8400	21000				
	Number of families that have installed water treatment and reuse systems				Tracking of funded TRIPs, and completion study.	Half-yearly	Project Management Units (PMUs) at state level	
	Families	0	6000	15000				
Output 3.1: Capacity and awareness building	Women, youth and traditional community members with increased capacity				Inputs from PMU Gender, Youth and Ethnicity team, tracking of PMAS system and supervisions missions	Half-yearly	PMUs	Learning by doing approach that will prioritize capacity-building opportunities to vulnerable groups
	People	0	3600	9000				
	Young communicators integrated in the network				Inputs from PMU Gender, Youth and Ethnicity team, tracking of PMAS system and supervisions missions	Half-yearly	PMUs	
	Persons	0	166	414				

Results Hierarchy	Indicators				Means of Verification			Assumptions
	Name	Baseline	Mid-Term	End Target	Source	Frequency	Responsibility	
Output 3.2: Scaling-up and sharing	Number of learning routes (national and international)				Inputs from PMU Gender, Youth and Ethnicity team, tracking of PMAS system and supervisions missions	Half-yearly	PMUs	Learning by doing approach that will prioritize capacity-building opportunities to vulnerable groups
	Learning routes (national and international)	0	3	7				
	Number of thematic policy dialogue studies completed				Inputs from PMU Gender, Youth and Ethnicity team, tracking of PMAS system and supervisions missions	Half-yearly	PMUs	
	Thematic policy dialogue studies completed	0	3	8				
	Number of policy dialogue working groups formed				Inputs from PMU Gender, Youth and Ethnicity team, tracking of PMAS system and supervisions missions	Half-yearly	PMUs	
	Policy dialogue working groups	0	3	3				

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex 2: Theory of change

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
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Planting climate resilience in rural communities of the Northeast, cofinanced by the Green Climate Fund

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Annex 2: PCRP Theory of Change and Transformative Pathways

The PRCP theory of change responds to the requirements and priorities of the three primary funding sources of the project: IFAD, the Green Climate Fund (GCF), and the Brazilian Development Bank (BNDES). To reinforce the project's contribution to climate change adaptation and mitigation, gender transformation, and nutrition and youth sensitivity, this section includes diagrams of the transformative pathways for each of these themes.

Diagram 1 – PCRCP Theory of Change

Diagram 2 – Climate Change Transformative Pathway

Diagram 3 – Gender Transformative Pathway

Diagram 4 – Youth transformative Pathway

Diagram 5 – Nutrition Transformative Pathway

Diagram 1 - Planting Climate Resilience Theory of Change

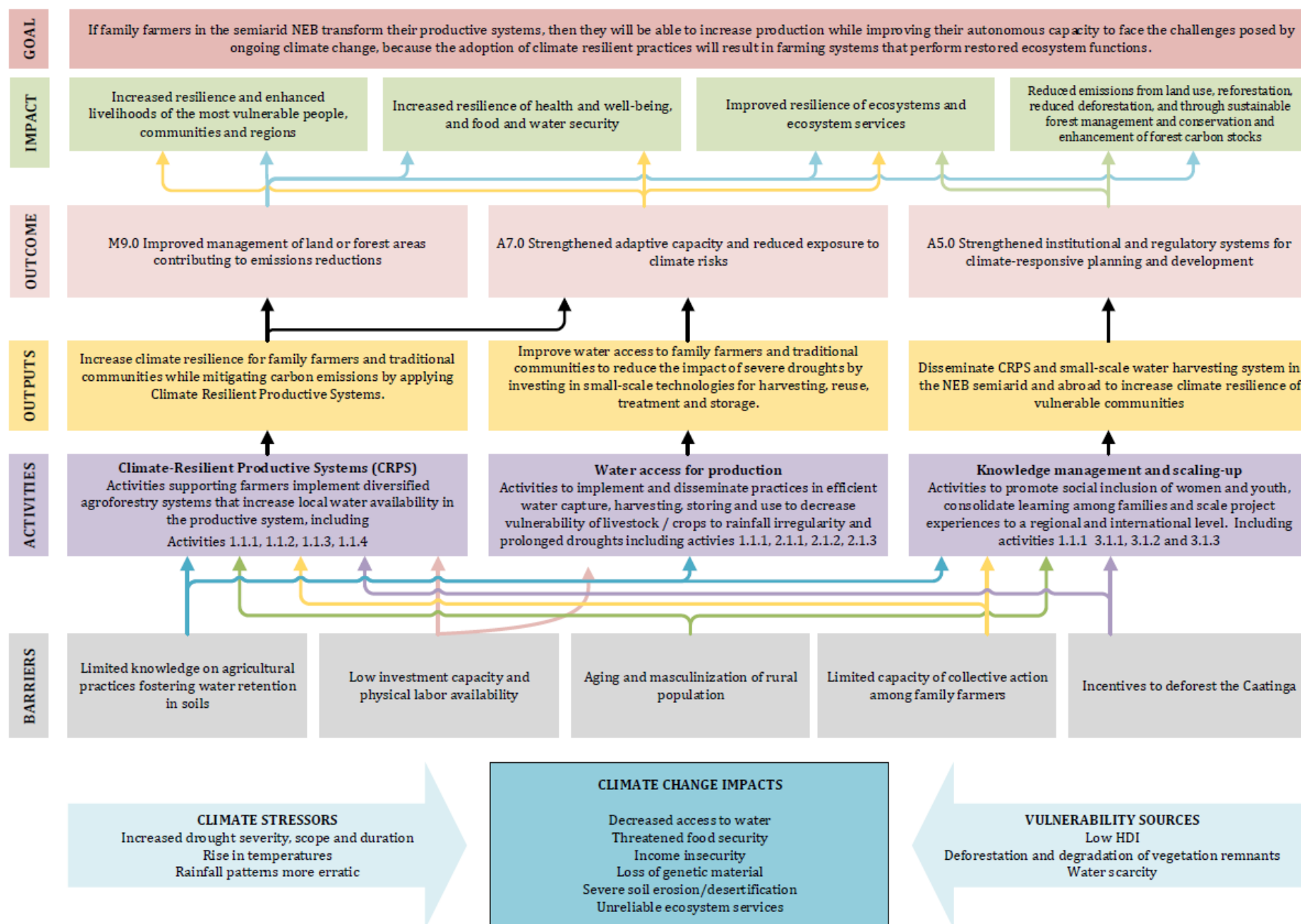


Diagram 2 – Climate Change Transformative Pathway

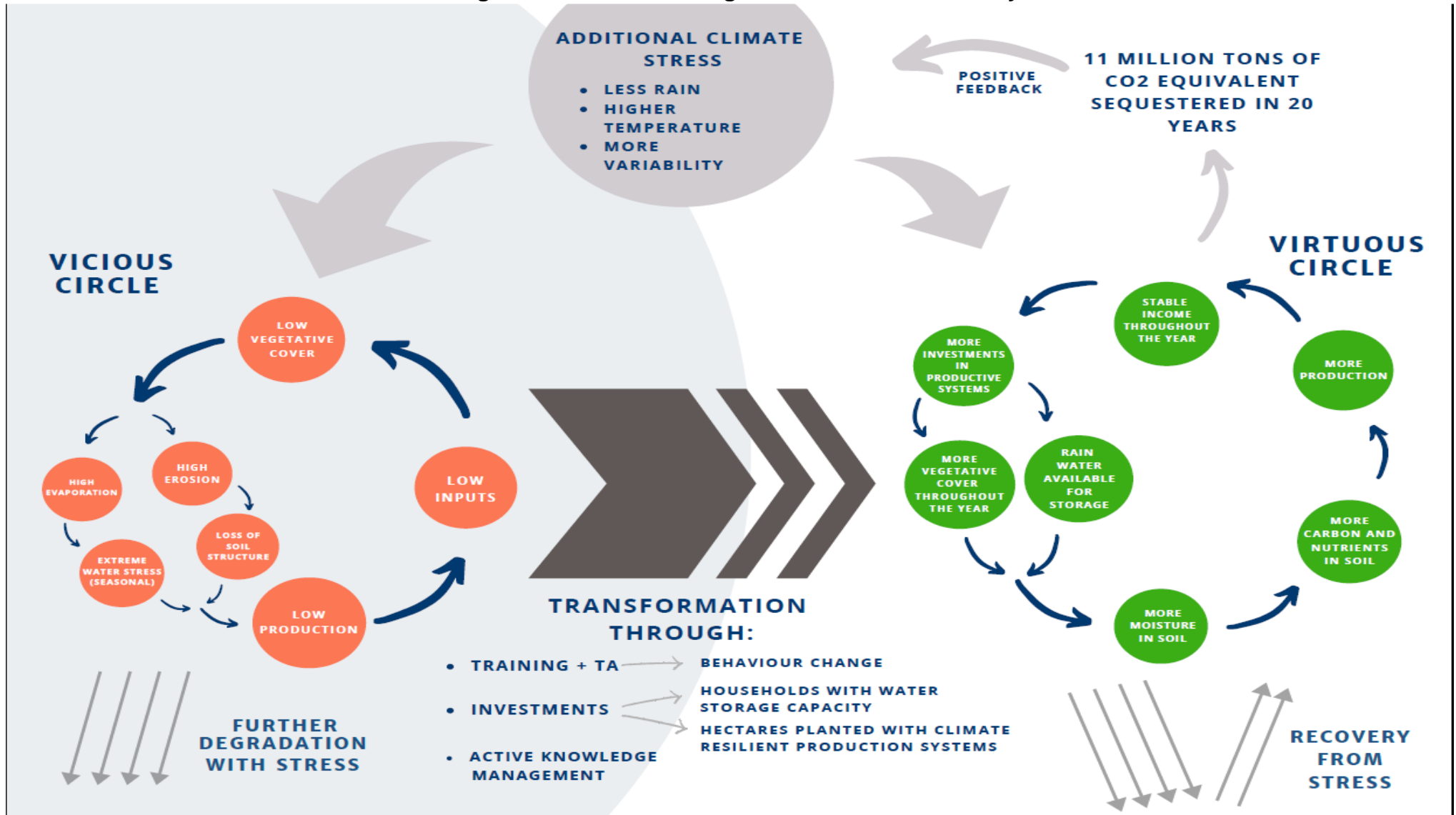


Diagram 3 – Gender Transformative Pathway

Aim	To increase PCR's impact on gender equality and strengthen women's empowerment in the semiarid region of Northeast Brazil by transforming social and cultural norms regarding gender roles		
Outreach	At least 40 percent of the beneficiaries will be women		
Objectives	Economic empowerment	Decision-making and representation	Equitable workload balance
Activities	<ul style="list-style-type: none"> - Increasing women's access to and control over assets – inputs, technologies and finance - and to economic services – such as extension, training and business development - through the promotion of CRPS in family farms and backyard gardens. - New income opportunities for women emerging from seedbanks, the sustainable management of the Caatinga (seeds, nuts, fruits, forage, etc.) and support for micro-enterprises to supply small-scale equipment for CRPS - Diversifying income opportunities by implementing CRPS thus creating new spaces/ opportunities/ markets and support for women's economic engagement - Sensitising men and boys as a strategy for supporting women's economic engagement 	<ul style="list-style-type: none"> - Ensure involvement of women in the development and implementation of Territorial Resilience Investment Plans - Ensure involvement of women in collective areas sustainable management (40%) - Leadership training for women - Encouraging and capacitating women to lead in non-traditional executive positions and to gain a voice through farmers' networks - Women will be encouraged to become farmer-trainers - Women-only groups will be promoted - Farmers' organisations will need to develop a gender strategy 	<ul style="list-style-type: none"> - Using “cadernetas agroecologicas” to engage household members in analysing and addressing gender inequalities in roles and stimulate discussions on redistributing household tasks among household members - Introduction of labour- and time-saving technologies (e.g. eco efficient stoves and biodigesters) - Increasing access to production water - “Cirandas” initiative to allow for childcare during project activities - Engaging men in household nutrition
	Policy engagement on gender-based violence		
M&E	Project-level Women's Empowerment in Agriculture Index (pro-WEAI)		

Diagram 4 – Youth Transformative Pathway

Aim	To increase PCR's impact on the social and economic empowerment of youth in the semiarid region of Northeast Brazil	
Outreach	At least 50 percent of the beneficiaries will be young people	
Objectives	Economic empowerment	Decision-making and representation
Activities	<ul style="list-style-type: none"> - Creating new income opportunities for youth emerging from the sustainable management of the Caatinga (seeds, nuts, fruits, forage, etc.) - Support for micro-enterprises to supply small-scale equipment for CRPS - Teaching and experimenting with CRSP in schools - Short-term professional courses with a focus on diversity of production systems and CRPS - Youth communicators network - Diversifying income opportunities by implementing CRPS - and finance and strengthened links with profitable mark - - 	<ul style="list-style-type: none"> - Ensure involvement of youth in the development and implementation of Territorial Resilience Investment Plans - Ensure involvement of youth in collective areas sustainable management (50%) - Leadership training for youth - Ensure youth participation in the farmers network (50%) - Development of a young communicators network
M&E	Age-disaggregated indicators	

Diagram 5 – Nutrition Transformative Pathway

Aim	To improve the quality of diets of project's beneficiary households by increasing availability and accessibility to diversified and nutritious foods			
Outreach	Direct beneficiaries of nutrition sensitive interventions: 36,000 HHs benefiting from backyard gardens and TA + 100,000 of students benefiting from the implementation of school gardens and nutrition education.			
Outcomes	Improved availability and accessibility of nutritious foods at HH level	Increased knowledge on nutrition and dietary diversification	Climate-resilient and sustainable management of natural resources	Women's empowerment and equitable workload balance
Activities	<ul style="list-style-type: none"> - Increase households' production of nutrient-rich crops and nutritious foods for own consumption through the implementation of CRPS backyard gardens (fruits, vegetables, small animals), including Neglected and Underutilized Species (NUS) (especially in quilombola and indigenous peoples' communities) - Promote home-food storage, food processing and conservation practices - Implement CRPS at schools - Improve households' income (to purchase nutritious food) - Diversify farm production using CRPS to enable production of food for family's consumption. 	<ul style="list-style-type: none"> - Promote nutrition education and dietary diversification in schools according to the socio-cultural characteristics of the target groups (traditional communities, indigenous peoples). - Train lunch makers on how to prepare healthy and nutritionally balanced school meals. - Integrate basics on nutrition, enriched and diversified diets, food safety practices sanitation and hygiene practices (WASH) in the provision of TA to target groups (e.g. women's groups). - Communication and knowledge management: include basics on nutrition and on WASH in guidebooks and manuals. 	<ul style="list-style-type: none"> - Promote CRPS and the sustainable management of Caatinga (seeds, nuts, fruits, forage, etc.) - Implement diverse and resilient CRPS backyards - Increase access to water and improve water security - Implement social technologies to improve water management and treatment for food production (such as, boardwalk cisterns for backyard gardens, treatment and reuse systems for household wastewater and systems for grey water reuse among others) 	<ul style="list-style-type: none"> - Introduce labour- and time-saving technologies (e.g. eco efficient stoves and biodigesters, technologies for water collection) - Increase women's access to and control over assets – inputs, technologies and finance – and new income opportunities for women
	Increase policy implementation dialogue at the State levels.			
M&E	<p>Outcome Indicator (C.I. 1.2.8): Percentage of women, 15-49 years of age, who consume at least 5 out of 10 food groups (MDD-W)</p> <p>Output Indicator (C.I. 1.1.8): Number of persons provided with targeted support to improve their nutrition (disaggregate per gender, age, indigenous peoples).</p>			

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex 3: Project cost and financing: Detailed costs tables

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

Brazil

Planting climate resilience in rural communities of the Northeast, cofinanced by the Green Climate Fund

Project Design Report

Annex 3: Project Costs and financing

Document Date: 04/09/2020

Project No. 2000002253

Latin America and the Caribbean Programme Management Department

A. Introduction

1. The current appendix aims to summarize the main assumptions, hypothesis and results of the Project cost estimates, as well as the financing plan for the eight-year implementation period. It has been calculated using the COSTAB software.

2. All unit costs have been collected from several consultations on the field, compared with updated quotations provided by the implementation entities and other national programs that are continuously dealing with those purchases.

B. Main assumptions and hypothesis

3. **Project life.** The Project will be executed for an 8-year period.

4. **Co-financing.** IFAD will finance 13.8% of the total Project costs. The current IFAD's PBAS (Performance Based Allocation System) financing cycle (2019-2021) allows loan of US\$ 11 million (5%) and there is a financing gap of US\$ 19 million (8.7%) to be covered from the allocation of IFAD's next PBAS cycle. GCF will finance US\$ 99.5 million (45.6% of total costs) with a loan of US\$ 65 million (29.8%) and a grant US\$ 34.5 million (15.8%). The Brazilian Government will finance US\$ 73 million (33.5% of the total cost, including taxes, operative costs and most of staff salaries), mainly in the form of loans from the Brazilian Development Bank (BNDES) to the participating States. Beneficiaries will contribute with US\$ 15.33 million (7% of total costs), in kind and labor.

5. **Exchange rate.** The exchange rate has been established at 4.5 R\$/US\$. It represents the current official exchange rate during the project design¹ and there are no clear signals of the exchange rate forecast to make further assumptions for the project life period.

6. **Price contingencies.** During the next eight years, local inflation is expected to be below the official target of 4%². It has been checked with other forecasts from IMF's, World Bank's and private sector estimates. Those sources also validate the international inflation that is estimated at 1,5³.

7. **Physical contingencies and taxes.** Physical contingencies and taxes have been defined for each type of expenditure. They are expressed in the table below.

Table 1. Parameters

Expenditure type	% Taxes	Physical cont.
A. Consultancies and Technical Assistance	18%	2%

¹ Central Bank of Brazil (BCB), March 2020.

² IBGE estimates and forecast, December 2019.

³ Commodity Market Outlook- World Bank- 2020.

B. Funds for Productive Development Plans	0%	0%
C. Civil works, goods, services and inputs	18%	2%
D. Management and Administrative Provision		
Salaries	0%	0%
Operating Costs	18%	5%

8. **Unit Costs.** Unit costs have been calculated in domestic currency unit (Reais-R\$-) and are based on field visits and consultations, including taxes. Each activity budget was defined with technical specialist during the mission after consultations with different sources of information. It is noted that all unit costs are indicative and are used for the purposes of estimating the overall project costs. These are, therefore, subject to changes and revision during project implementation, every year at the time of preparing Annual Work Plans and Budgets.

9. **Taxes and duties.** Taxes and duties have considered the current ICMS rate for all the Northeast States involved (18%). It will be applied for the following categories: Consultancies and Technical Assistance and Civil works, services and inputs.

10. **Expenditure Accounts.** Expenditure accounts have been established considering IFAD's official list of 2013⁴ for loans and the simplification proposed in recent financial agreements in Brazil in line with co-financiers' requirements. Consequently, two expenditure accounts are considered: Good, Services, Works and Grants (including the items A to C mentioned above) and Management and Administrative Provision.

A. Summary of Programme's main cost tables

Total Costs. Total Project costs over the eight-year period are estimated at US\$ 217.8 million, including contingencies and taxes. Base costs are estimated at US\$ 212.3 million and both physical and price contingencies represent US\$ 5.5 million (2.5% of total costs). Investment costs are US\$ 204.1 million (94% of total costs) and recurrent costs are estimated at US\$ 13.7 million (6% of total costs).

11. **Costs by component.** Component 1 comprises 37.9% of total costs; Component 2 comprises 51%; Component 3, 4.3% and Project Management Unit (PMU) costs comprises 6.8%.

⁴ IC/FOD/02/2013.

Graphic 1. Costs by Component (%)

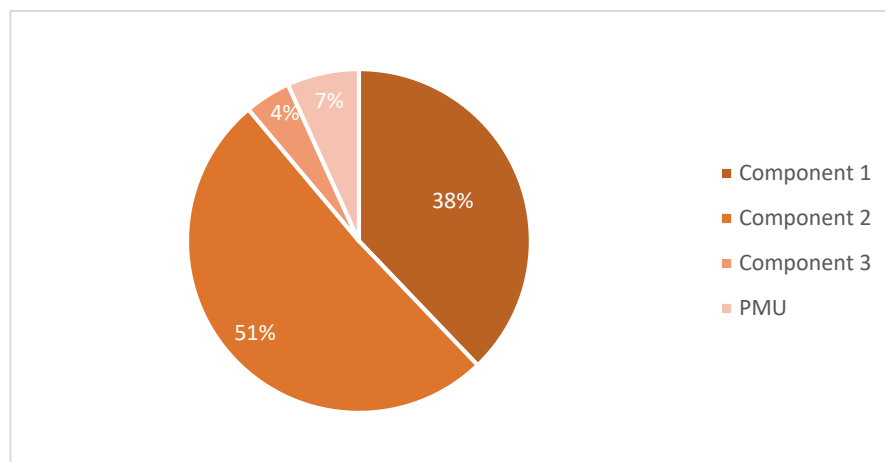


Table 2. Project Costs by Component (local '000 and US\$ '000)

Item	US\$ Million	R\$ Million	%
Component 1	82.47	371	37.9
Component 2	111.14	500	51.0
Component 3	9.442	42	4.3
PMU	14.78	66	6.8
Total	217.83	980	100

12. **Costs by financier.** IFAD will finance 13.8% of the total Project costs. The current IFAD's PBAS (Performance Based Allocation System) financing cycle (2019-20121) allows loan of US\$ 11 million (5%) and there is a financing gap of US\$ 19 million (8.7%) to be covered from the allocation of IFAD's next PBAS cycle. GCF will finance US\$ 99.5 million (45.6% of total costs) with a loan of US\$ 65 million (29.8%) and a grant US\$ 34.5 million (15.8%). The Brazilian Government will finance US\$ 73 million (33.5% of the total cost, including taxes, operative costs and most of staff salaries), mainly in the form of loans from the Brazilian Development Bank (BNDES) to the participating States. Beneficiaries will contribute with US\$ 15.33 million (7% of total costs), in kind and labor.

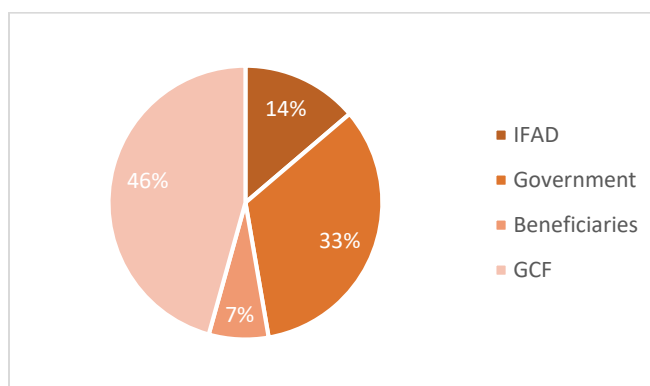
Table 3. Project Costs by financier (000 U\$S)

Item	U\$S Million	R\$ Million	%
IFAD 11	30	136	14
GCF Loan	65	293	30
GCF Grant	34.5	155	16
Government	73	329	34
Beneficiaries	15.3	69	7
Total	217.8	980	100

Table 3. Project Costs by financier by Component (000 U\$S)

	IFAD		GCF Loan		GCF Grant		BNDES / Government		Beneficiaries		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
1. Climate-Resilient Productive Systems (CRPS)	17 039.5	20.6	22 560	27.4	31 370	38.0	5 510	6.7	5 994	7.3	82 473	37.9
2. Access to water	11 762.3	10.5	42 440	38.2	-	-	47 600	42.8	9 339	8.4	111 142	51.0
3. Knowledge management and scaling-up	1 198.2	12.7	-	-	2 892	30.6	5 352	56.7	-	-	9 442	4.3
4. Project Management	-	-	-	-	239	1.6	14 538	98.4	-	-	14 777	6.8
Total Project Costs	30 000.0	13.7	65 000	29.8	34 500	15.8	73 000	33.5	15 333	7.0	217 833	100.0

Graphic 2. Costs by financier (%)



13. **Costs by year.** The project costs by year are presented in the table below:

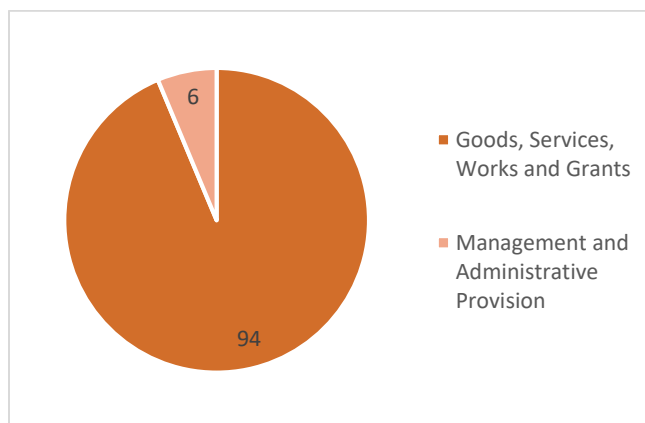
Table 4. Project's Costs by year (including contingencies, in '000 U\$S)

Component	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Total
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Monto
Component 1.	107	0	12,948	16	18,450	22	19,904	24	17,066	21	10,243	12	2,543	3	1,212	1	82,473
Component 2.	0	0	17,633	16	34,954	31	36,035	32	20,615	19	1,906	2	0	0	0	0	111,142
Component 3.	454	5	1,133	12	1,513	16	1,937	21	1,851	20	1,253	13	524	6	776	8	9,442
PMU	589	4	1,930	13	2,302	16	2,360	16	2,356	16	2,393	16	2,351	16	495	3	14,777
Total	1,150	1	33,644	15	57,220	26	60,236	28	41,889	19	15,794	7	5,418	2	2,483	1	217,833

Table 5. Project's Costs by expenditure category by financier (000 U\$S)

Expenditure category	IFAD		GCF loan		GCF Grant		Government /BNDES		Beneficiaries		Total	
	Amount		Amount		Amount		Amount		Amount		Amount	
	U\$S MM	%	U\$S MM	%	U\$S MM	%	Cash/ In kind	%	In-kind	%	U\$S MM	%
Goods, Services, Works, and Grants	30,000	14	65,000	32	34,500	17	59,282	29	15,333	8	204,115	94
Management and Administrative Provision	-	-	-	-	-	-	13,718	100	-	-	13,718	6
Total	30,000	14	65,000	30	34,500	16	73,000	34	15,333	7	217,833	100

Graphic 3. Costs by Expenditure Category (%)



Annex 1: Main summary tables

Table 1. Project's costs by Expenditure type by year (including contingencies (in 000 U\$S))

Brazil									
Planting Climate Resilience in rural communities of the Northe									
Expenditure Accounts by Years -- Totals Including Cc									
	Totals Including Contingencies (US\$ '000)								
	1	2	3	4	5	6	7	8	Total
I. Investment Costs									
A. Consultancies and Technical Assistance	188	3,525	7,588	10,290	9,129	6,135	2,712	1,696	41,263
B. Funds for Productive Development Plans	-	27,438	46,053	46,053	28,807	6,351	-	-	154,702
C. Civil works, goods, services and inputs	835	891	1,377	1,660	1,671	993	392	330	8,150
Total Investment Costs	1,023	31,855	55,018	58,003	39,608	13,479	3,104	2,026	204,115
II. Recurrent Costs									
A. Management and Administrative Provision	127	1,790	2,202	2,233	2,281	2,314	2,314	457	13,718
Total Recurrent Costs	127	1,790	2,202	2,233	2,281	2,314	2,314	457	13,718
Total PROJECT COSTS	1,150	33,644	57,220	60,236	41,889	15,794	5,418	2,483	217,833

Table 2. Project's costs by Expenditure type by Component including contingencies (in 000 U\$S)

Expenditure Acc.	Component 1	Component 2	Component 3	PMU	Total
Good, Services, Works and Grants	82,473	111,142	9,442	1,058	204,115
Management and administrative provision	-	-	-	13,718	13,718
Total	82,473	111,142	9,442	14,777	217,833

Annex 2: Detailed cost tables

Component 1

Brazil

Planting Climate Resilience in rural communities of the Northeast

Table 1. Component 1. Climate-Resilient Productive Systems (CRPS)

Detailed Costs

Planting Climate Resilience in rural communities of the Northeast											Unit	Cost										
Table 1. Component 1. Climate-Resilient Productive Systems (CRPS)											(US\$	Totals Including Contingencies (000 US\$)										
Detailed Costs											'000)											
	Unit	1	2	3	4	5	6	7	8	Total		1	2	3	4	5	6	7	8	Total		
I. Output 1.1. Increase climate resilience for family farmers and tradi																						
A. Activity 1.1.1. Selection of Project Areas and development of TRII																						
B. Activity 1.1.2. Implement CRPS in family farms and backyard gard																						
Sub-activity 1.1.2.1. Implement CRPS in family farms																						
Climate resilient Investment (ISA Familia)	Number	-	6 200	6 200	6 200	6 200	6 200	-	-	31 000	1,02	-	6 351	6 351	6 351	6 351	6 351	-	-	31 754		
TA for Climate Resilient Investment /a	Family/yr	-	6 200	12 400	18 600	18 600	18 600	12 400	6 200	93 000	0,19	-	1 171	2 342	3 512	3 512	3 512	2 342	1 171	17 562		
Subtotal																						
Sub-activity 1.1.2.2. Implement backyard gardens using CRPS																						
Investment in Backyard garden (ISA Quintais) /b	Number	-	6 900	11 100	11 100	6 900	-	-	-	36 000	0,51	-	3 523	5 667	5 667	3 523	-	-	-	18 379		
Subtotal																						
C. Activity 1.1.3. Implement Collective Resilient Investments																						
Sub-activity 1.1.3.1. Implement Collective Areas Sustainable Man:																						
Investment in Natural Resource Management (ISA coletivo)	Number	-	-	20	20	20	-	-	-	60	95,47	-	-	1 909	1 909	1 909	-	-	-	5 728		
TA for Natural Resource Management	Family/yr	-	-	600	1 200	1 200	600	-	-	3 600	0,19	-	-	113	227	227	113	-	-	680		
Subtotal																						
Sub-activity 1.1.3.2. Implement CRPS in Schools																						
Investment in Schools (ISA Escola)	Number	-	250	250	250	250	-	-	-	1 000	4,08	-	1 021	1 021	1 021	1 021	-	-	-	4 083		
TA for Schools /c	School/yr	-	200	400	600	600	600	400	400	3 200	0,10	-	20	41	61	61	61	41	41	327		
Subtotal																						
Sub-activity 1.1.3.3. Test productive models of Bio saline agricultu																						
Biosaline agriculture systems	System	-	8	8	8	-	-	-	-	24	20,27	-	162	162	162	-	-	-	-	486		
TA for Biosaline agriculture systems	Family/yr	-	400	800	800	400	-	-	-	2 400	0,10	-	43	90	94	49	-	-	-	276		
Subtotal																						
Subtotal																						
D. Activity 1.1.4. Build a Farmers Network and Promote local entrepri																						
Sub-activity 1.1.4.1. Build a Farmers Network																						
Training of farmer-trainers	ed Agro-Tect	-	55	128	230	138	-	-	-	551	0,84	-	49	118	221	138	-	-	-	526		
Local exchange-visits	Participant	600	1 000	2 400	2 500	1 500	1 000	1 000	-	10 000	0,03	19	33	82	89	56	39	40	-	358		
Regional exchange-visits	Participants	300	600	800	800	600	600	300	-	4 000	0,09	26	54	75	78	61	63	33	-	391		
Workshops and trainings for Family farmers and Community Leaders	Participants	-	1 600	2 400	2 500	1 500	1 000	1 000	-	10 000	0,07	-	115	179	194	121	84	87	-	779		
Subtotal																						
Sub-activity 1.1.4.2. Promote local entrepreneurship for products																						
Grants for micro-entreprises to develop Agroforestry suppliers	Number	-	30	20	20	-	-	-	-	70	12,60	-	378	252	252	-	-	-	-	882		
TA for Micro-entreprises	Family/yr	-	30	50	70	40	20	-	-	210	0,93	-	28	47	66	38	19	-	-	198		
Subtotal																						
Subtotal																						
Total																						

/a 1 to 140 ratio

/b Backyard gardens will be linked to production cisterns, to be supported with investment and TA under Component 2

/c including sustainable NRM practices and nutrition education

Component 2

Brazil
Planting Climate Resilience in rural communities of the Northeast

Table 2. Component 2. Water access for production

Detailed Costs

Planting Climate Resilience in rural communities of the Northeast											Unit Cost (US\$ '000)	Totals Including Contingencies (000 US\$)								
Table 2. Component 2. Water access for production																				
Detailed Costs																				
Unit	1	2	3	4	5	6	7	8	Total			1	2	3	4	5	6	7	8	Total
II. Output 2.1. Improve water access to family farmers and traditional communities																				
1. Activity 2.1.1. Build boardwalk cisterns for backyard gardens																				
Cisterns /a	Number	-	3 000	7 000	7 000	3 000	-	-	-	20 000	3,58	-	10 748	25 079	25 079	10 748	-	-	71 654	
TA for Cisterns /b	Family/yr	-	3 000	10 000	14 000	10 000	3 000	-	-	40 000	0,19	-	601	2 083	3 033	2 253	703	-	8 674	
Subtotal												-	11 349	27 162	28 112	13 001	703	-	80 328	
2. Activity 2.1.2. Implement social technologies to increase water availability in pe																				
Other social technology systems (small farm ponds and groundw ater storage basins)	Number	-	150	350	350	150	-	-	-	1 000	1,78	-	267	623	623	267	-	-	1 781	
TA for Other social technology systems	Family/yr	-	150	500	700	500	150	-	-	2 000	0,19	-	30	104	152	113	35	-	434	
Subtotal												-	297	727	775	380	35	-	2 215	
3. Activity 2.1.3. Implement treatment and reuse systems for household wastew																				
Re-use grey and black w ater systems /c	Number	-	3 750	3 750	3 750	3 750	-	-	-	15 000	1,33	-	4 989	4 989	4 989	4 989	-	-	19 954	
TA for Re-use grey and black w ater systems	Family/yr	-	3 750	7 500	7 500	7 500	3 750	-	-	30 000	0,19	-	751	1 562	1 625	1 690	879	-	6 507	
Re-use grey and black w ater- training for trainers and exchanges	Lumpsum											-	247	513	534	555	289	-	2 138	
Subtotal												-	5 987	7 064	7 147	7 234	1 168	-	28 600	
Total												-	17 633	34 954	36 035	20 615	1 906	-	111 142	

\a 52.000lts- Cisterna Calçada, Enxurrada, etc.
\b Estimated at 2 years of TA per family that builds a cistern
\c Sistemas de Reuso de aguas cinzas / Fossa verde

Component 3

Brazil
Planting Climate Resilience in rural communities of the Northeast
Table 3. Component 3. Knowledge management and scaling-up
Detailed Costs

											Unit Cost (US\$ '000)	Totals Including Contingencies (000 US\$)								
		Quantities																		
Unit	1	2	3	4	5	6	7	8	Total	1	2	3	4	5	6	7	8	Total		
III. Output 3.1. CRPS and small-scale water harvesting system disseminated in the NE																				
A. Activity 3.1.1. Raise awareness and build capacities of women, youth and traditic																				
Sub-activity 3.1.1.1. Develop a young communicators network																				
Workshops for young communicators /a	Events	-	18	18	18	-	-	-	54	4,05	-	79	82	85	-	-	-	246		
Inter-state exchange visits /b	Events	-	-	3	3	3	-	-	9	6,76	-	-	23	24	25	-	-	71		
Inter-regional exchange visits /c	Events	-	-	12	12	12	-	-	36	2,70	-	-	36	38	39	-	-	114		
Trainings for youths /d	Events	-	48	48	48	48	51	-	243	4,00	-	208	216	225	234	258	-	1 140		
Learning scholarships for youths	Youth	-	-	198	198	198	-	-	594	1,62	-	-	321	321	321	-	-	963		
Smartphones and equipments for young communicators	Youth	414	-	-	-	-	-	-	414	0,32	140	-	-	-	-	-	-	140		
Laptops for youths	Number	6	-	-	-	-	-	-	6	0,95	6	-	-	-	-	-	-	6		
Handbooks and other communication material	Number	-	-	-	8	8	8	-	24	12,16	-	-	-	114	118	123	-	355		
Illustrated handbooks and guidelines	Number	-	-	10	10	10	-	-	30	9,54	-	-	107	112	116	-	-	335		
New sletters and bulletins	Number	-	-	14	14	14	14	14	70	0,95	-	-	15	15	16	17	17	81		
Multimedia material / Videos	Number	-	-	-	4	4	4	-	12	13,51	-	-	-	63	66	68	-	197		
Communication Equipment /e	Lumpsum/Office	12	-	-	3	-	-	-	15	2,46	31	-	-	9	-	-	-	39		
Subtotal											176	287	801	1 006	935	467	17	-	3 689	
Sub-activity 3.1.1.2. Strengthen capacity for women, youth, and traditional commi																				
Trainings for Women on sustainable technologies /f	Number	-	75	75	75	75	-	-	300	0,97	-	79	82	85	89	-	-	335		
Workshops and meetings for Women /g	Number	-	72	72	72	72	-	-	360	0,97	-	76	79	82	85	89	-	411		
Exchange visits for w omen /h	Number	-	3	2	2	2	2	1	12	3,41	-	11	8	8	8	9	4	48		
Training for TA in Gender approach, race and ethnicity /i	Number	-	9	9	9	-	-	-	27	4,05	-	39	41	43	-	-	-	123		
Case studies in traditional communities	Number	-	-	-	-	1	1	1	3	18,92	-	-	-	-	23	24	25	72		
Childcare support activities	Lumpsum										-	19	19	20	21	22	23	124		
Subtotal											-	224	229	238	226	143	52	-	1 113	
Subtotal											176	511	1 030	1 244	1 162	610	70	-	4 802	
B. Activity 3.1.2. Drive scaling-up, unlock policy barriers and experiment with CRPS																				
Sub-activity 3.1.2.1. Promote south-south cooperation																				
National Learning Route / Exchange-Visit /j	Events	-	-	1	1	1	1	-	4	21,62	-	-	24	25	26	27	-	103		
International Learning Route / Exchange visit (LAC) /k	Events	-	-	-	1	-	1	-	2	56,76	-	-	-	66	-	72	-	138		
International Learning Route / Exchange Visit (Africa)	Events	-	-	-	1	-	-	-	1	78,38	-	-	-	92	-	-	-	92		
Subtotal											-	-	24	183	26	99	-	-	333	
Sub-activity 3.1.2.2. Facilitate discussions to unlock policy barriers																				
Legal studies	Number	1	1	1	1	1	1	1	8	20,00	21	22	23	23	24	25	26	27	192	
Forums and Meetings at the federal level	Events	-	3	3	3	3	3	3	21	4,32	-	14	15	15	16	16	17	18	111	
Technical Meetings at the regional and local level	Events	5	9	9	9	9	9	9	68	2,16	11	21	22	23	24	25	26	27	178	
Gender Forum at the sub-project level	Events	-	3	3	3	3	3	3	21	2,16	-	7	7	8	8	8	9	9	55	
Consultant / Advisor	person-month	-	-	12	12	12	12	12	72	2,16	-	-	29	30	31	32	33	35	190	
Subtotal											32	64	95	99	103	107	111	115	725	
Sub-activity 3.1.2.3. Experiment with CRPS and resilience participatory monitorin	Events	-	-	27	27	27	27	-	108	2,22	-	-	68	70	73	76	-	287		
Subtotal											32	64	187	352	202	282	111	115	1 345	
C. Activity 3.1.3. Plan, Monitor, Evaluate and Learn																				
Sub-activity 3.1.3.1. PMEL at National Level																			58 58428.9	
Know ledge Management- Information Platform /m	Lumpsum	-	-	-	-	-	1	-	1	12,16	-	-	-	-	-	15	-	15		
Operating services	lumpsum										25	57	62	67	75	82	41	409		
Baseline and Impact Evaluation surveys /n	Number	-	1	-	-	-	-	-	1	2 225,00	-	243	-	-	-	-	-	308 552		
Mid-term Evaluation	Number	-	-	-	-	1	-	-	1	100,00	-	-	-	-	122	-	-	122		
GIS Evaluations	Number	-	4	-	-	4	-	4	12	7,51	-	33	-	-	37	-	-	41 110		
Planning and Communication Services	lumpsum	1	1	1	1	1	1	1	8	14,67	15	16	17	17	18	19	19	20 141		
IT and management inputs and services	lumpsum										95	-	-	4	-	-	-	99		
IT Services	lumpsum/yr	1	1	1	1	1	1	1	8	14,67	15	16	17	17	18	19	19	20 141		
M&E Services	lumpsum	1	1	1	1	1	1	1	8	14,67	15	16	17	17	18	19	19	20 141		
Project Completion Report	Number	-	-	-	-	-	-	-	1	18,92	-	-	-	-	-	-	-	26 26		
M&E Meetings /o	Number	-	1	1	1	1	1	1	7	3,78	-	4	4	4	4	5	5	5 32		
Planning Workshops	Number	-	1	1	1	1	1	1	7	3,78	-	4	4	4	4	5	5	5 32		
Studies, Sistematizations and other KM products	Number	-	-	-	2	-	-	2	4	2,70	-	-	-	-	6	-	-	13		
Subtotal											166	389	120	138	297	162	116	446	1 833	
Sub-activity 3.1.3.2. PMEL at State Level																				
Studies, Sistematizations and other KM products to support MTR and PCR	Number	-	-	-	6	-	-	6	12	2,71	-	-	-	19	-	-	21	-	40	
Planning Workshops	Number	-	3	3	3	3	3	3	21	3,78	-	12	13	13	14	14	15	16	97	
Territorial Comitee Meetings	Number	-	3	3	3	3	3	3	21	1,89	-	6	6	7	7	7	7	8	48	
M&E Meetings /p	Number	-	3	3	3	3	3	3	21	3,78	-	12	13	13	14	14	15	16	97	
State-specific studies	Number	3	5	5	5	5	5	5	38	26,21	80	139	145	150	156	163	169	176 1 178		
Subtotal											80	170	177	203	191	199	228	215	1 461	
Subtotal											246	559	297	341	487	361	344	660	3 294	
Total											454	1 133	1 513	1 937	1 851	1 253	524	776	9 442	

Va Target: 414 youths
Vb Target: 270 youths
Vc Target: 414 youths
Vd Target: 810 youths
Ve Recycling in yr 4
Vf Target: 6.000 women / Including Nutrition and WASH training for TA in Gender approach, race and ethnicity and nutrition
Vg Target: 9000 women
Vh Target: 480 women
Vi Target: 810 participants.
Vj 25 participants / each
Vk 25 participants each
Vl Target: 2160 youths
Vm Based on sistematizations and innovation experiences.
Vn 1 in year 1, 1 in year 8- Including the PRO-WEAI Study and MDDW
Vo 2 each year
Vp 2 each year

PMU

Brazil
Planting Climate Resilience in rural communities of the Northeast
Table 4. Project Management
Detailed Costs

Planting Climate Resilience in rural communities of the Northeast											Unit Cost (US\$ '000)	Totals Including Contingencies (000 US\$)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
Table 4. Project Management																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																

/a 12 Offices with different needs during the first 4 years

/b 1 laptop per PMU staff, and 25% replaced in Yr4, Total 87 persons, 42 at the State level and 45 at the local level (29 persons per State)

/c 1 smartphone per PMU staff, and 25% replaced in Yr4, Total 87 persons, 42 at the State level and 45 at the local level (29 persons per State)

/d 1 for 4 and 1/4 recycling in yr 4

/e 1 for each PMU office- recycling in yr 4

/f Including Nutrition

/g Including Planning

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex 4: Economic and Financial Analysis

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

Component	Output	Activity	Financing Source	Financing Instrument	Budget Account Description	Budget Notes*	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Amount Year 5 (USD)	Amount Year 6 (USD)	Amount Year 7 (USD)	Amount Year 8 (USD)	Total (USD)	
Component 1. Climate-Resilient Productive Systems (CRPS)	Output 1.1. Increase climate resilience for family farmers and traditional communities while mitigating carbon emissions by applying CRPS	Activity 1.1.1. Selection of Project Areas and development of TRiPs	Country	Loan	Goods, Services, Works, and Grants	1A	62 424	-	-	-	-	-	-	-	62 424	
		Activity 1.1.2. Implement CRPS in family farms and backyard gardens	GCF	Grant	Goods, Services, Works, and Grants	1B	-	6 041 635	6 268 928	6 268 928	6 041 635	5 668 226	-	-	30 289 350	
			GCF	Loan	Goods, Services, Works, and Grants		-	2 631 479	4 233 249	4 233 249	2 631 479	-	-	13 729 456		
			Country	Loan	Goods, Services, Works, and Grants		-	346 315	610 665	821 408	767 801	679 733	421 486	210 743	3 858 152	
			Accredited Entity	Loan	Goods, Services, Works, and Grants		-	1 037 552	2 044 777	3 004 829	2 957 655	2 880 155	1 920 103	960 052	14 805 122	
		Activity 1.1.3. Implement Collective Resilient Investments	GCF	Loan	Goods, Services, Works, and Grants	1C	-	918 730	2 637 126	2 637 126	2 637 126	-	-	-	8 830 108	
			Country	Loan	Goods, Services, Works, and Grants		-	11 493	136 915	254 549	246 438	124 348	7 364	7 364	788 472	
		Activity 1.1.4. Build a Farmers Network and Promote local entrepreneurship for products and services that support family farming	Accredited Entity	Loan	Goods, Services, Works, and Grants	1D	-	214 521	269 728	289 462	90 349	50 320	33 546	33 546	981 472	
			Country	Loan	Goods, Services, Works, and Grants		8 113	85 151	178 702	285 814	180 542	33 446	28 851	-	800 619	
			Accredited Entity	Loan	Goods, Services, Works, and Grants		36 960	165 508	275 796	296 109	194 768	152 366	131 431	-	1 252 938	
			GCF	Grant	Goods, Services, Works, and Grants		-	406 314	299 190	318 066	37 752	18 876	-	-	1 080 197	
		TOTAL COMPONENT 1							107 497	11 858 698	16 955 075	18 409 539	15 785 546	9 607 470	2 542 781	1 211 705
	Component 2. Water access for production	Output 2.1 Improve water access to family farmers and traditional communities to reduce the impact of severe droughts by investing in small-scale technologies for harvesting, reuse, treatment and storage	Activity 2.1.1. Build boardwalk cisterns for backyard gardens	GCF	Loan	Goods, Services, Works, and Grants	2A	-	4 270 890	9 965 410	9 965 410	4 270 890	-	-	-	28 472 601
Country				Loan	Goods, Services, Works, and Grants	-		5 281 200	13 003 885	13 953 879	6 933 560	703 035	-	-	39 875 559	
Accredited Entity				Loan	Goods, Services, Works, and Grants	-		722 165	1 685 053	1 685 053	722 165	-	-	-	4 814 436	
Activity 2.1.2. Implement social technologies to increase water availability in periods of drought			Country	Loan	Goods, Services, Works, and Grants	2B	-	83 472	228 823	276 322	166 090	35 152	-	-	789 859	
			Accredited Entity	Loan	Goods, Services, Works, and Grants		-	186 985	436 299	436 299	186 985	-	-	-	1 246 568	
Activity 2.1.3. Implement treatment and reuse systems for household wastewater			GCF	Loan	Goods, Services, Works, and Grants	2C	-	3 491 959	3 491 959	3 491 959	3 491 959	-	-	-	13 967 835	
			Country	Loan	Goods, Services, Works, and Grants		-	800 560	1 665 165	1 731 772	1 801 042	936 542	-	-	6 935 081	
			Accredited Entity	Loan	Goods, Services, Works, and Grants		-	1 195 156	1 408 405	1 424 833	1 441 919	230 992	-	-	5 701 306	
TOTAL COMPONENT 2							-	16 032 388	31 884 998	32 965 526	19 014 611	1 905 721	-	101 803 245		
Component 3. Knowledge management and scaling-up	Output 3.1. CRPS and small-scale water harvesting system disseminated in the NEB semi-arid and abroad to increase climate resilience of vulnerable communities.	Activity 3.1.1. Raise awareness and build capacities of women, youth and traditional communities	Country	Loan	Goods, Services, Works, and Grants	3A	176 306	510 712	1 029 957	1 244 075	1 161 816	609 708	69 593	-	4 802 166	
		Activity 3.1.2. Drive scaling-up, unlock policy barriers and experiment with CRPS and resilience participatory monitoring model	GCF	Grant	Goods, Services, Works, and Grants	3B	32 056	63 751	119 256	282 176	128 988	205 990	111 050	115 492	1 058 759	
			Country	Loan	Goods, Services, Works, and Grants		-	-	67 507	70 207	73 015	75 936	-	-	286 665	
			GCF	Grant	Goods, Services, Works, and Grants		3C	165 517	389 142	120 083	138 032	296 554	162 329	115 799	445 695	1 833 153
		Country	Loan	Goods, Services, Works, and Grants	14 438	30 551		31 774	36 465	34 366	35 741	41 018	38 657	263 010		
		Accredited Entity	Loan	Goods, Services, Works, and Grants	65 771	139 179		144 746	166 118	156 557	162 820	186 861	176 106	1 198 158		

Component	Output	Activity	Financing Source	Financing Instrument	Budget Account Description	Budget Notes*	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Amount Year 5 (USD)	Amount Year 6 (USD)	Amount Year 7 (USD)	Amount Year 8 (USD)	Total (USD)
Component 1. Climate-Resilient Productive Systems (CRPS)	Output 1.1. Increase climate resilience for family farmers and traditional communities while mitigating carbon emissions by applying CRPS	Activity 1.1.2. Implement CRPS in family farms and backyard gardens	GCF	Grant	Goods, Services, Works, and Grants	1B	-	6 041 635	6 268 928	6 268 928	6 041 635	5 668 226	-	-	30 289 350
			GCF	Loan	Goods, Services, Works, and Grants		-	2 631 479	4 233 249	4 233 249	2 631 479	-	-	-	13 729 456
		Activity 1.1.3. Implement Collective Resilient Investments	GCF	Loan	Goods, Services, Works, and Grants	1C	-	918 730	2 637 126	2 637 126	2 637 126	-	-	-	8 830 108
		Activity 1.1.4. Build a Farmers Network and Promote local entrepreneurship for products and services that support family farming	GCF	Grant	Goods, Services, Works, and Grants	1D	-	406 314	299 190	318 066	37 752	18 876	-	-	1 080 197
	TOTAL COMPONENT 1						-	9 998 158	13 438 492	13 457 368	11 347 992	5 687 101	-	-	53 929 112
Component 2. Water access for production	Output 2.1. Improve water access to family farmers and traditional communities to reduce the impact of severe droughts by investing in small-scale technologies for harvesting, reuse, treatment and storage	Activity 2.1.1. Build boardwalk cisterns for backyard gardens	GCF	Loan	Goods, Services, Works, and Grants	2A	-	4 270 890	9 965 410	9 965 410	4 270 890	-	-	-	28 472 601
		Activity 2.1.3. Implement treatment and reuse systems for household wastewater	GCF	Loan	Goods, Services, Works, and Grants	2C	-	3 491 959	3 491 959	3 491 959	3 491 959	-	-	-	13 967 835
	TOTAL COMPONENT 2						-	7 762 849	13 457 369	13 457 369	7 762 849	-	-	-	42 440 436
Component 3. Knowledge management and scaling-up	Output 3.1. CRPS and small-scale water harvesting system disseminated in the NEB semiarid and abroad to increase climate resilience of vulnerable communities.	Activity 3.1.2. Drive scaling-up, unlock policy barriers and experiment with CRPS and resilience participatory monitoring model	GCF	Grant	Goods, Services, Works, and Grants	3B	32 056	63 751	119 256	282 176	128 988	205 990	111 050	115 492	1 058 759
		Activity 3.1.3. Plan, Monitor, Evaluate and Learn	GCF	Grant	Goods, Services, Works, and Grants	3C	165 517	389 142	120 083	138 032	296 554	162 329	115 799	445 695	1 833 153

Compo manage	TOTAL COMPONENT 3					197 573	452 894	239 340	420 209	425 542	368 319	226 849	561 187	2 891 912
Project Management Costs	Project Management	GCF	Grant	Goods, Services, Works, and Grants	4A	-	30 202	31 410	32 666	33 973	35 332	36 745	38 215	238 541
	Total PMC					-	30 202	31 410	32 666	33 973	35 332	36 745	38 215	238 541
TOTAL		Total Components	GCF	Goods, Services, Works, and Grants		197 573	18 244 102	27 166 611	27 367 612	19 570 355	6 090 752	263 594	599 402	99 500 000
				Management and Administrative Provision										
Total Amount						197 573	18 244 102	27 166 611	27 367 612	19 570 355	6 090 752	263 594	599 402	99 500 000
Total Amount GCF						197 573	18 244 102	27 166 611	27 367 612	19 570 355	6 090 752	263 594	599 402	99 500 000
GCF Grant						197 573	6 931 044	6 838 867	7 039 868	6 538 901	6 090 752	263 594	599 402	34 500 000
GCF Loan						-	11 313 058	20 327 744	20 327 744	13 031 454	-	-	-	65 000 000
Check													99 500 000	

GCF Grant	
	34 500 000
GCF Loan	
	65 000 000

Totals	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	TOTAL
Goods, Services, Works, and Grants	197 573	18 244 102	27 166 611	27 367 612	19 570 355	6 090 752	263 594	599 402	99 500 000
Management and Administrative Provision	-	-	-	-	-	-	-	-	-
TOTAL	197 573	18 244 102	27 166 611	27 367 612	19 570 355	6 090 752	263 594	599 402	99 500 000
	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Total
C1	-	9 998 158	13 438 492	13 457 368	11 347 992	5 687 101	-	-	53 929 112
C2	-	7 762 849	13 457 369	13 457 369	7 762 849	-	-	-	42 440 436
C3	197 573	452 894	239 340	420 209	425 542	368 319	226 849	561 187	2 891 912
PMU	-	30 202	31 410	32 666	33 973	35 332	36 745	38 215	238 541
TOTAL	197 573	18 244 102	27 166 611	27 367 612	19 570 355	6 090 752	263 594	599 402	99 500 000

	Budget Note	Activity	Sub-activity	Detailed Budget Notes	Budget line	GCF Budget Account	Unit	Quantity	Unit Cost	Total	Total	GCF	% Price and Physical Contingencies			
COMPONENT 1	1A	Activity 1.1.1. Selection of Project Areas and development of TRIPs		3 Studies USD 20,000 each	Development of TRIPs	Local consultant	Study	3	20 000	60 000	62 424	-	4%			
	1B	Activity 1.1.2. Implement CRPS in family farms and backyard gardens	Sub-activity 1.1.2.1. Implement CRPS in family farms	31,000 families with Investment Plans (922 USD per ISA) and TA at 185 USD per family for 2 years	Climate resilient investment (ISA Familia)	Equipment	Number	31 000	922	28 568 595	28 578 648	28 341 128	0%			
			Sub-activity 1.1.2.2. Implement backyard gardens using CRPS	36,000 families supported with backyard gardens (USD 459 per backyard)	TA for Climate Resilient Investment	Professional/Contractual Services	Family/yr	93 000	185	17 205 000	17 561 919	-	2%			
	1C	Activity 1.1.3. Implement Collective Resilient Investments	Sub-activity 1.1.3.1. Implement Collective Areas Sustainable Management (CASM)	60 Collective Areas Sustainable Management (CASM) implemented and 3,600 farmers trained and participating	Investment in Backyard garden (ISA Quintals)	Equipment	Number	36 000	459	16 541 494	16 541 513	15 677 679	0%			
			Sub-activity 1.1.3.2. Implement CRPS in Schools	1000 ISAs for schools USD 3675 per school and TA USD 100 per school per year for 2 years	Investment in Natural Resource Management (ISA colectivo)	Equipment	Number	60	85 953	5 157 201	5 155 189	5 155 189	0%			
			Sub-activity 1.1.3.3. Test productive models of Bio saline agriculture	Test 24 productive models of Bio saline agriculture systems and TA at USD 20,270 per system	Professional/Contractual Services	Family/yr	3 600	185	666 000	679 816	-	2%				
			Sub-activity 1.1.4.1. Build a Farmers Network	Build a Farmers Network with 551 agrotechnicians trained at 837 USD per person, 10000 farmers participating in local exchanges at 310USD each, 4000 farmers participating in regional exchanges at USD 85 each and 10000 farmers participating in workshops and trainings at USD 68 each	Investment in Schools (ISA Escola)	Equipment	Number	1 000	3 675	3 674 676	3 674 919	3 674 919	0%			
	1D	Activity 1.1.4. Build a Farmers Network and Promote local entrepreneurship for products and services that support family farming	Sub-activity 1.1.4.1. Build a Farmers Network	Build a Farmers Network with 551 agrotechnicians trained at 837 USD per person, 10000 farmers participating in local exchanges at 310USD each, 4000 farmers participating in regional exchanges at USD 85 each and 10000 farmers participating in workshops and trainings at USD 68 each	TA for Schools	Professional/Contractual Services	Schools/yr	3 200	100	320 000	327 282	-	2%			
			Sub-activity 1.1.4.2. Promote local entrepreneurship for products and services that support family farming	Promote local 70 microentrepreneurs for products and services that support family farming at USD 12 600 each with 3 years technical assistance each at USD 930 per year	Biosaline agriculture systems	Equipment	Systems	24	20 270	486 480	486 486	-	0%			
			Sub-activity 1.1.4.2. Promote local entrepreneurship for products and services that support family farming	Promote local 70 microentrepreneurs for products and services that support family farming at USD 12 600 each with 3 years technical assistance each at USD 930 per year	TA for Biosaline agriculture systems	Professional/Contractual Services	Family/yr	2 400	100	240 000	276 359	-	13%			
			Sub-activity 1.1.4.2. Promote local entrepreneurship for products and services that support family farming	Promote local 70 microentrepreneurs for products and services that support family farming at USD 12 600 each with 3 years technical assistance each at USD 930 per year	Training of farmer-trainers			551	837	461 187	525 584	-	12%			
	COMPONENT 2	2A	Activity 2.1.1. Build boardwalk cisterns for backyard gardens		20000 boardwalk cisterns built at 3224 USD per system and 2 y TA at 185 USD per farmer per year	Cisterns	Equipment	Number	20 000	3 224	64 474 594	64 488 654	28 472 601	0%		
		2B	Activity 2.1.2. Implement social technologies to increase water availability in periods of drought	Sub-activity 2.1.2.1. Build small farm ponds	1000 beneficiaries with other social technology systems at 1603 USD per system and TA for 2 years at 185 per farmer per year	TA for Micro-enterprises	Professional/ Contractual Services	Family/yr	210	930	195 300	198 197	198 197	1%		
Sub-activity 2.1.2.2. Construct small groundwater storage basins				1000 beneficiaries with other social technology systems at 1603 USD per system and TA for 2 years at 185 per farmer per year	TA for Cisterns	Professional/ Contractual Services	Family/yr	40 000	185	7 400 000	8 673 942	-	15%			
2C		Activity 2.1.3. Implement treatment and reuse systems for household wastewater	Sub-activity 2.1.3.1. Implement systems for grey water reuse	15000 Re-use grey and black water systems (1200 USD per system) and TA for 2 years at 185 per farmer per year including training of trainers and exchanges	Other social technology systems (small farm ponds and groundwater storage basins)	Equipment	Number	1 000	1 603	1 602 919	1 602 730	-	0%			
			Sub-activity 2.1.3.2. Implement green septic tanks	15000 Re-use grey and black water systems (1200 USD per system) and TA for 2 years at 185 per farmer per year including training of trainers and exchanges	TA for Other social technology systems	Professional/ Contractual Services	Family/yr	2 000	185	370 000	433 697	-	15%			
COMPONENT 3		3A	Activity 3.1.1. Raise awareness and build capacities of women, youth and traditional communities	Sub-activity 3.1.1.1. Develop a young communicators network	Young communicators network developed with 54 workshops of youth communicators at USD 4054 each, 9 inter-state exchange visits at USD 6756 each, 36 inter-regional exchange visits at USD 2700 each, 243 trainings for youths at USD 4000 each, 584 youths benefited with learning scholarships (1622 USD per youth), 414 youth communicators equipped with laptops and smartphones at USD 325 each and other communication equipments and material including handbooks, multimedia, newsletters and bulletins.	Re-use grey and black water systems	Equipment	Number	15 000	1 200	17 999 595	17 958 645	13 967 835	0%		
						TA for Re-use grey and black water systems	Professional/ Contractual Services	Family/yr	30 000	185	5 550 000	6 507 457	-	15%		
						Re-use grey and black water- training for trainers and exchanges	Training, workshops, and conference	lumpsum	5	427 624	2 138 120	2 138 120	-	0%		
						Workshops for young communicators	Training, workshops, and conference	Events	4 054	54	218 919	246 475	-	11%		
						Inter-state exchange visits	Training, workshops, and conference	Events	6 757	9	60 811	71 204	-	15%		
						Inter-regional exchange visits	Training, workshops, and conference	Events	2 703	36	97 297	113 926	-	15%		
						Trainings for youths	Training, workshops, and conference	Events	4 000	243	972 000	1 140 415	-	15%		
						Learning Scholarships for youths	Training, workshops, and conference	Youth	1 622	594	963 242	963 243	-	0%		
	Smartphones and equipments for young communicators					Equipment	Youth	324	414	134 268	139 695	-	4%			
	Laptops for youths					Equipment	Number	946	6	5 676	5 905	-	4%			
	Handbooks and other communication material					Equipment	Number	12 162	24	291 892	355 450	-	18%			
	Illustrated handbooks and guidelines					Equipment	Number	9 541	30	286 216	335 133	-	15%			
	Newsletters and bulletins			Equipment	Number	946	70	66 217	80 717	-	18%					
Multimedia material / Videos	Equipment			Number	13 514	12	162 162	197 472	-	18%						
Communication Equipment to be financing at the beginning and in year 4	Equipment			Lumpsum/Office	2 459	15	36 892	39 341	-	6%						
3B	Activity 3.1.2. Drive scaling-up, unlock policy barriers and experiment with CRPS and resilience participatory monitoring model			Sub-activity 3.1.1.2. Strengthen capacity for women, youth, and traditional communities	Studies and systematizations (3) at USD 19 000 each, 27 trainings for TA teams in Gender approach, race and ethnicity at 4 000 USD each, 12 exchanges visits for women at USD 3400 each, childcare support activities (3 at 20000 each) and 300 Trainings for Women on sustainable technologies at USD 972 and 362 workshops and meetings at 660 USD each	Trainings for Women on sustainable technologies	Training, workshops, and conference	Number	973	300	291 900	335 292	-	13%		
						Workshops and meetings for Women	Training, workshops, and conference	Number	973	360	350 280	410 555	-	15%		
		Exchange visits for women	Training, workshops, and conference			Number	3 405	12	40 860	48 083	-	15%				
		Training for TA in Gender approach, race and ethnicity	Training, workshops, and conference			Number	4 054	27	109 458	123 238	-	11%				
		Case studies in traditional communities	Local consultant			Number	18 919	3	56 757	71 880	-	21%				
		Sub-activity 3.1.2.1. Promote south-south cooperation	4 National Learning Routes / Exchange-Visit (at USD 21 600 each) and 3 International learning routes in LAC and Africa (at USD 56000 and USD 78000 each)	Childcare support activities	Equipment	27 297	6	103 782	124 142	-	16%					
				National Learning Route / Exchange-Visit	Training, workshops, and conference	Events	21 622	4	86 488	103 320	103 320	16%				
				International Learning Route / Exchange visit (LAC)	Training, workshops, and conference	Events	56 757	2	113 514	138 266	138 266	18%				
				International Learning Route / Exchange Visit (Africa)	Training, workshops, and conference	Events	78 378	1	78 378	91 727	91 727	15%				
				Legal studies	Local consultant	Number	20 000	8	160 000	191 730	191 730	17%				
Sub-activity 3.1.2.2. Facilitate discussions to unlock policy barriers	Forums and meetings (28) at USD 4 324, Legal studies (8) at USD 20 000, Technical meetings (75) at USD 2 162, advisor support for 6 years at 2 162 per month	Forums and Meetings at the federal level	Training, workshops, and conference	Events	4 324	21	90 804	110 868	110 868	18%						
		Technical Meetings at the regional and local level	Training, workshops, and conference	Events	2 162	68	147 016	177 550	177 550	17%						
		Gender Forum at the sub-project level	Training, workshops, and conference	Events	2 162	21	45 402	55 434	55 434	18%						
		Consultant / Advisor	Local consultant	person-month	2 162	72	155 664	189 865	189 865	18%						
		Experimentation of a CRPS participatory monitoring model	Training, workshops, and conference	Events	2 222	108	239 976	286 665	-	16%						
3C	Activity 3.1.3. Drive scaling-up, unlock policy barriers and experiment with CRPS and resilience participatory monitoring model	Sub-activity 3.1.3.1. PMEL at National Level	KM information platforms, M&E meetings, GIS solutions, Studies, systematizations and planning workshops, Baseline, mid-term and impact evaluation (including the PRO-WEA Study)	Knowledge Management- Information Platform	Professional/Contractual Services	Lumpsum	12 162	1	12 162	15 395	15 395	21%				
				Operating services	Professional/Contractual Services	lumpsum	58 429	7	409 002	409 002	409 002	0%				
				Baseline and Impact Evaluation surveys	Local consultant	Number	225 000	2	450 000	551 500	551 500	18%				
				Mid-term Evaluation	Local consultant	Number	100 000	1	100 000	121 712	121 712	18%				
				GIS Evaluations	Local consultant	Number	7 514	12	90 168	110 245	110 245	18%				
				Planning and Communication Services	Professional/Contractual Services	lumpsum	14 667	8	117 336	140 600	140 600	17%				
				IT and management inputs and services	Professional/Contractual Services	lumpsum	95 164	1	95 164	99 481	99 481	4%				
				IT Services	Professional/Contractual Services	lumpsum/yr	14 667	8	117 336	140 600	140 600	17%				

Project Management	3C	Activity 3.1.3. Plan, Monitor, Evaluate and Learn		M&E Services	Professional/Contractual Services	lumpsum	14 667	8	117 336	140 600	140 600	17%
				Project Completion Report	Local consultant	Number	18 919	1	18 919	25 902	25 902	27%
				M&E Meetings	Training, workshops, and conference	Number	3 784	7	26 488	32 337	32 337	18%
				Planning Workshops	Training, workshops, and conference	Number	3 784	7	26 488	32 337	32 337	18%
				Studies, Systematizations and other KM products	Local consultant	Number	2 703	4	10 812	13 442	13 442	20%
		Sub-activity 3.1.3.2. PMEL at State Level	M&E meetings (14) territorial committee meetings (7) , planning workshops (14) and studies (10)	Studies, Systematizations and other KM products to support MTR and PCR	Local consultant	Number	2 706	12	32 472	40 379	-	20%
				Planning Workshops	Training, workshops, and conference	Number	3 784	21	79 464	97 010	-	18%
				Territorial Committee Meetings	Training, workshops, and conference	Number	1 891	21	39 711	48 474	-	18%
				M&E Meetings	Training, workshops, and conference	Number	3 784	21	79 464	97 010	-	18%
				State-specific studies	Local consultant	Number	26 212	38	996 056	1 178 296	-	15%
	4A	Investment Costs	Refurbishment of Regional and Local SIU Office (12), inputs and equipments, workshops and trainings, consultancies and studies. 12 Offices with different needs during the first 4 years	Refurbishment of Regional and Local SIU Offices	Equipment	Lumpsum/office	13 514	12	162 162	177 331	-	9%
				Laptops-1 laptop per SIU staff, and 25% replaced in Yr4	Equipment	Number	600	109	65 400	69 757	-	6%
				Smartphones- 1 smartphone per SIU staff, and 25% replaced in Yr4	Equipment	Number	251	109	27 359	29 182	-	6%
				Printers- 1 for 4 and 1/4 recycling in yr 4	Equipment	Number	216	24	5 184	5 511	-	6%
				Vehicles and transportation- 1 for each SIU office- recycling in yr 4	Equipment	Number	27 027	12	324 324	337 427	-	4%
				Workshops and trainings for SIU Staff	Training, workshops, and conference	Events	2 850	60	171 000	200 431	-	15%
				Project audits by CPMU.	Audits	Local consultant	28 471	7	199 297	238 541	238 541	16%
				Project Manager	Staff	Pers.month	1 892	252	476 784	476 757	-	0%
				Project Assistant	Staff	Pers.month	730	252	183 960	183 892	-	0%
				Procurement Specialist	Staff	Pers.month	1 622	216	350 352	350 270	-	0%
		Recurrent Costs	Salaries and operating costs for SIU staff (State level and field teams), travel expenses, transportation, maintenance and service and utilities	Accountant Specialist	Staff	Pers.month	1 622	432	700 704	700 541	-	0%
				Technical Analysts	Staff	Pers.month	1 081	648	700 488	700 541	-	0%
				Financial Management Specialist	Staff	Pers.month	1 622	252	408 744	408 649	-	0%
				Agroforestry and Resilient Production Specialist	Staff	Pers.month	1 622	216	350 352	350 270	-	0%
				Youth, Gender and traditional communities Specialist	Staff	Pers.month	1 622	216	350 352	350 270	-	0%
				Communication and Knowledge Management	Staff	Pers.month	1 622	216	350 352	350 270	-	0%
				M&E Specialist /including Planning	Staff	Pers.month	1 622	252	408 744	408 649	-	0%
				M&E Analyst	Staff	Pers.month	1 216	252	306 432	306 486	-	0%
				Local SIU Supervisor	Staff	Pers.month	1 622	702	1 118 644	1 118 378	-	0%
				Agroforestry and Resilient Production Specialist	Staff	Pers.month	1 351	594	802 494	802 703	-	0%
				M&E Specialist	Staff	Pers.month	1 216	702	853 632	853 784	-	0%
				Communication and KM Specialist	Staff	Pers.month	1 216	594	722 304	722 432	-	0%
				Youth, gender and traditional communities specialist	Staff	Pers.month	1 216	594	722 304	722 432	-	0%
				Travel expenses at State and Local Level	Travel	Office/Month	3 243	216	700 488	862 607	-	19%
				Transportation maintenance at State and Local Level	Travel	Unit	2 162	39	84 318	104 198	-	19%
				Transportation insurance at State and Local Level	Travel	Unit	2 703	72	194 616	244 405	-	20%
				Office operating expenses at State and Local Level	Other	Office/month	1 612	792	1 276 704	1 572 222	-	19%
				Services and Utilities at State and Local Level	Other	Office/Month	2 162	792	1 712 304	2 108 596	-	19%
				Total					\$ 197 257 208	\$ 202 500 000	\$ 99 500 000	3%

GCF Budget Account	IFAD Budget Account
International Consultants	
Local Consultants	
Professional/ Contractual Services	#REF!
conference	
Equipment	
Staff	
Travel	
Others	#REF!

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Brazil

Planting Climate Resilience in rural communities of the Northeast
Table 1. Component 1. Climate-Resilient Productive Systems (CRPS)

Detailed Costs

	Unit	Quantities								Unit Cost (US\$ '000)	Totals Including Contingencies (000 US\$)							
		1	2	3	4	5	6	7	8	Total	1	2	3	4	5	6	7	8
I. Output 1.1. Increase climate resilience for family farmers and traditional com																		
A. Activity 1.1.1. Selection of Project Areas and development of TRIPs	Study	3	-	-	-	-	-	-	-	3	20,00	62	-	-	-	-	-	-
B. Activity 1.1.2. Implement CRPS in family farms and backyard gardens																		
Sub-activity 1.1.2.1. Implement CRPS in family farms																		
Climate resilient Investment (ISA Familia)	Number	-	6 200	6 200	6 200	6 200	6 200	-	-	31 000	1,02	-	6 351	6 351	6 351	6 351	6 351	-
TA for Climate Resilient Investment /a	Family/yr	-	6 200	12 400	18 600	18 600	18 600	12 400	6 200	93 000	0,19	-	1 171	2 342	3 512	3 512	3 512	1 171
Subtotal													-	7 522	8 692	9 863	9 863	2 342
Sub-activity 1.1.2.2. Implement backyard gardens using CRPS																		
Investment in Backyard garden (ISA Quintais) /b	Number	-	6 900	11 100	11 100	6 900	-	-	-	36 000	0,51	-	3 523	5 667	5 667	3 523	-	-
Subtotal													-	11 044	14 359	15 530	13 386	9 863
C. Activity 1.1.3. Implement Collective Resilient Investments																		
Sub-activity 1.1.3.1. Implement Collective Areas Sustainable Management																		
Investment in Natural Resource Management (ISA coletivo)	Number	-	-	20	20	20	-	-	-	60	95,47	-	-	1 909	1 909	1 909	-	-
TA for Natural Resource Management	Family/yr	-	-	600	1 200	1 200	600	-	-	3 600	0,19	-	-	113	227	227	113	-
Subtotal													-	-	2 023	2 136	2 136	113
Sub-activity 1.1.3.2. Implement CRPS in Schools																		
Investment in Schools (ISA Escola)	Number	-	250	250	250	250	-	-	-	1 000	4,08	-	1 021	1 021	1 021	1 021	-	-
TA for Schools /c	School/yr	-	200	400	600	600	600	400	400	3 200	0,10	-	20	41	61	61	41	41
Subtotal													-	1 041	1 062	1 082	1 082	61
Sub-activity 1.1.3.3. Test productive models of Bio saline agriculture																		
Biosaline agriculture systems	System	-	8	8	8	-	-	-	-	24	20,27	-	162	162	162	-	-	-
TA for Biosaline agriculture systems	Family/yr	-	400	800	800	400	-	-	-	2 400	0,10	-	43	90	94	49	-	-
Subtotal													-	206	252	256	49	-
Subtotal													-	1 247	3 337	3 474	3 267	175
D. Activity 1.1.4. Build a Farmers Network and Promote local entrepreneurship																		
Sub-activity 1.1.4.1. Build a Farmers Network																		
Training of farmer-trainers	ed Agro-Tech	-	55	128	230	138	-	-	-	551	0,84	-	49	118	221	138	-	-
Local exchange-visits	Participant	600	1 000	2 400	2 500	1 500	1 000	1 000	-	10 000	0,03	19	33	82	89	56	39	40
Regional exchange-visits	Participants	300	600	800	800	600	600	300	-	4 000	0,09	26	54	75	78	61	63	33
Workshops and trainings for Family farmers and Community Leaders	Participants	-	1 600	2 400	2 500	1 500	1 000	1 000	-	10 000	0,07	-	115	179	194	121	84	87
Subtotal													45	251	454	582	375	186
Sub-activity 1.1.4.2. Promote local entrepreneurship for products and serv																		
Grants for micro-entreprises to develop Agroforestry suppliers	Number	-	30	20	20	-	-	-	-	70	12,60	-	378	252	252	-	-	-
TA for Micro-entreprises	Family/yr	-	30	50	70	40	20	-	-	210	0,93	-	28	47	66	38	19	-
Subtotal													-	406	299	318	38	19
Subtotal													45	657	754	900	413	205
Total													107	12 948	18 450	19 904	17 066	10 243

/a 1 to 140 ratio

/b Backyard gardens will be linked to production cisterns, to be supported with investment and TA under Component 2

/c including sustainable NRM practices and nutrition education

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Summary Divisions		Other Accounts		Fin. Rule	IFAD								1	2	3
Total	Component	Expenditure Account	Disb. Acct.		1	2	3	4	5	6	7	8	Total		
62	COMP1	TAC	ENR_C	GOVT	-	-	-	-	-	-	-	-	-	-	-
					0	0	0	0	0	0	0	0	0		
					0	0	0	0	0	0	0	0	0		
31 754	COMP1	GAS	CR_C	GCFG (89.252%), BEN (10%)	-	-	-	-	-	-	-	-	-	-	-
17 562	COMP1	TAC	ENR_C	IFAD (100%)	-	960	1 920	2 880	2 880	2 880	1 920	960	14 401	-	-
49 316					-	960	1 920	2 880	2 880	2 880	1 920	960	14 401	-	-
					0	0	0	0	0	0	0	0	0		
18 379	COMP1	GAS	CR_C	BEN (10%), GCFL (74.7%), GCFG (10.6%), IFAD (2.2%)	-	78	125	125	78	-	-	-	404	-	2 631
67 695					-	1 038	2 045	3 005	2 958	2 880	1 920	960	14 805	-	2 631
					0	0	0	0	0	0	0	0	0		4 233
					0	0	0	0	0	0	0	0	0		4 233
5 728	COMP1	GAS	ENR_C	BEN (10%), GCFL (90%)	-	-	-	-	-	-	-	-	-	-	1 718
680	COMP1	TAC	ENR_C	GOVT	-	-	-	-	-	-	-	-	-	-	-
6 408					-	-	-	-	-	-	-	-	-	-	1 718
					0	0	0	0	0	0	0	0	0		
4 083	COMP1	GAS	ENR_C	GCFL (90%), BEN (10%)	-	-	-	-	-	-	-	-	-	-	919
327	COMP1	TAC	ENR_C	IFAD (100%)	-	17	34	50	50	50	34	34	268	-	-
4 411					-	17	34	50	50	50	34	34	268	-	919
					0	0	0	0	0	0	0	0	0		
486	COMP1	GAS	ENR_C	IFAD (100%)	-	162	162	162	-	-	-	-	486	-	-
276	COMP1	TAC	ENR_C	IFAD (100%)	-	36	74	77	40	-	-	-	227	-	-
763					-	198	236	239	40	-	-	-	713	-	-
11 581					-	215	270	289	90	50	34	34	981	-	919
					0	0	0	0	0	0	0	0	0		2 637
					0	0	0	0	0	0	0	0	0		
526	COMP1	TAC	GCS_C	GOVT	-	-	-	-	-	-	-	-	-	-	-
358	COMP1	TAC	CR_C	IFAD (100%)	16	27	67	73	46	32	33	-	293	-	-
391	COMP1	TAC	CR_C	IFAD (100%)	21	44	62	64	50	52	27	-	320	-	-
779	COMP1	TAC	CR_C	IFAD (100%)	-	94	147	159	99	69	72	-	639	-	-
2 054					37	166	276	296	195	152	131	-	1 253	-	-
					0	0	0	0	0	0	0	0	0		
882	COMP1	GAS	CR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-	-	-
198	COMP1	TAC	CR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-	-	-
1 080					-	-	-	-	-	-	-	-	-	-	-
3 134					37	166	276	296	195	152	131	-	1 253	-	-
82 473				7200	37	1 418	2 590	3 590	3 243	3 083	2 085	994	17 040	-	3 550
															6 870

76 478

76 478

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Expenditures by Financiers (000 US\$)															
GCF Loan						GCF Grant									
4	5	6	7	8	Total	1	2	3	4	5	6	7	8	Total	1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	62
-	-	-	-	-	-	-	5 668	5 668	5 668	5 668	5 668	-	-	28 341	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	5 668	5 668	5 668	5 668	5 668	-	-	28 341	-
4 233	2 631	-	-	-	13 729	-	373	601	601	373	-	-	-	1 948	-
4 233	2 631	-	-	-	13 729	-	6 042	6 269	6 269	6 042	5 668	-	-	30 289	-
1 718	1 718	-	-	-	5 155	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1 718	1 718	-	-	-	5 155	-	-	-	-	-	-	-	-	-	-
919	919	-	-	-	3 675	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
919	919	-	-	-	3 675	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2 637	2 637	-	-	-	8 830	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8
-	-	-	-	-	-	-	378	252	252	-	-	-	-	882	-
-	-	-	-	-	-	-	28	47	66	38	19	-	-	198	-
-	-	-	-	-	-	-	406	299	318	38	19	-	-	1 080	-
-	-	-	-	-	-	-	406	299	318	38	19	-	-	1 080	8
6 870	5 269	-	-	-	22 560	-	6 448	6 568	6 587	6 079	5 687	-	-	31 370	71

53 929

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BNDES/Government								Beneficiaries								Total
2	3	4	5	6	7	8	Total	1	2	3	4	5	6	7	8	Total
-	-	-	-	-	-	-	62	-	-	-	-	-	-	-	-	-
48	48	48	48	48	-	-	238	-	635	635	635	635	635	-	-	3 175
211	421	632	632	632	421	211	3 161	-	-	-	-	-	-	-	-	-
258	469	680	680	680	421	211	3 399	-	635	635	635	635	635	-	-	3 175
88	142	142	88	-	-	-	459	-	352	567	567	352	-	-	-	1 838
346	611	821	768	680	421	211	3 858	-	987	1 202	1 202	987	635	-	-	5 013
-	-0	-0	-0	-	-	-	-0	-	-	191	191	191	-	-	-	573
-	113	227	227	113	-	-	680	-	-	-	-	-	-	-	-	-
-	113	227	227	113	-	-	680	-	-	191	191	191	-	-	-	573
-0	-0	-0	-0	-	-	-	-0	-	102	102	102	102	-	-	-	408
4	7	11	11	11	7	7	59	-	-	-	-	-	-	-	-	-
4	7	11	11	11	7	7	59	-	102	102	102	102	-	-	-	408
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	16	17	9	-	-	-	50	-	-	-	-	-	-	-	-	-
8	16	17	9	-	-	-	50	-	-	-	-	-	-	-	-	-
11	137	255	246	124	7	7	788	-	102	293	293	293	-	-	-	981
49	118	221	138	-	-	-	526	-	-	-	-	-	-	-	-	-
6	15	16	10	7	7	-	64	-	-	-	-	-	-	-	-	-
10	14	14	11	11	6	-	70	-	-	-	-	-	-	-	-	-
21	32	35	22	15	16	-	140	-	-	-	-	-	-	-	-	-
85	179	286	181	33	29	-	801	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
85	179	286	181	33	29	-	801	-	-	-	-	-	-	-	-	-
443	926	1 362	1 195	838	458	218	5 510	-	1 089	1 495	1 495	1 280	635	-	-	5 994

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Brazil

Planting Climate Resilience in rural communities of the Northeast

Table 2. Component 2. Water access for production

Detailed Costs

Planting Climate Resilience in rural communities of the Northeast											Unit
Table 2. Component 2. Water access for production											Cost
Detailed Costs											(US\$ '000)
	Unit	Quantities									
		1	2	3	4	5	6	7	8	Total	
II. Output 2.1. Improve water access to family farmers and traditional communities to reduce the											
1. Activity 2.1.1. Build boardwalk cisterns for backyard gardens											
Cisterns /a	Number	-	3 000	7 000	7 000	3 000	-	-	-	20 000	3,58
TA for Cisterns /b	Family/yr	-	3 000	10 000	14 000	10 000	3 000	-	-	40 000	0,19
Subtotal											
2. Activity 2.1.2. Implement social technologies to increase water availability in periods of dr											
Other social technology systems (small farm ponds and groundwater storage basins)	Number	-	150	350	350	150	-	-	-	1 000	1,78
TA for Other social technology systems	Family/yr	-	150	500	700	500	150	-	-	2 000	0,19
Subtotal											
3. Activity 2.1.3. Implement treatment and reuse systems for household wastewater											
Re-use grey and black water systems /c	Number	-	3 750	3 750	3 750	3 750	-	-	-	15 000	1,33
TA for Re-use grey and black water systems	Family/yr	-	3 750	7 500	7 500	7 500	3 750	-	-	30 000	0,19
Re-use grey and black water- training for trainers and exchanges	Lumpsum										
Subtotal											
Total											

/a 52.000lts- Cisterna Calçada, Enxurrada, etc.

/b Estimated at 2 years of TA per family that builds a cistern

/c Sistemas de Reuso de aguas cinzas / Fossa verde

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Totals Including Contingencies (000 US\$)								Summary Divisions			Other Accounts														
1	2	3	4	5	6	7	8	Total	Component	Expenditure Account	Disb. Acct.	Fin. Rule	1	2	3	4	IFAD				5	6	7	8	Total
-	10 748	25 079	25 079	10 748	-	-	-	71 654	COMP2	GAS	AWR_C	BEN (10%), GCFL (39.7362%), IFAD (6.719%) GOVT	-	722	1 685	1 685	722	-	-	-	-	-	-	4 814	
-	601	2 083	3 033	2 253	703	-	-	8 674	COMP2	TAC	AWR_C		-	-	-	-	-	-	-	-	-	-	-	-	
-	11 349	27 162	28 112	13 001	703	-	-	80 328					-	722	1 685	1 685	722	-	-	-	-	-	-	-	
-	267	623	623	267	-	-	-	1 781	COMP2	GAS	AWR_C	BEN (10%), IFAD (70%) GOVT	0	0	0	0	0	0	0	0	0	0	0		
-	30	104	152	113	35	-	-	434	COMP2	TAC	AWR_C		-	187	436	436	187	-	-	-	-	-	-	1 247	
-	297	727	775	380	35	-	-	2 215					-	-	-	-	-	-	-	-	-	-	-	-	
-	4 989	4 989	4 989	4 989	-	-	-	19 954	COMP2	GAS	AWR_C	BEN (10%), GCFL (70%), IFAD (20%) GOVT IFAD (80%)	-	187	436	436	187	-	-	-	-	-	-	1 247	
-	751	1 562	1 625	1 690	879	-	-	6 507	COMP2	TAC	AWR_C		0	0	0	0	0	0	0	0	0	0	0		
-	247	513	534	555	289	-	-	2 138	COMP2	TAC	AWR_C		-	998	998	998	998	-	-	-	-	-	-	3 991	
-	5 987	7 064	7 147	7 234	1 168	-	-	28 600					-	-	-	-	-	-	-	-	-	-	-	-	
-	17 633	34 954	36 035	20 615	1 906	-	-	111 142					-	197	411	427	444	231	-	-	-	-	-	1 710	
													-	1 195	1 408	1 425	1 442	231	-	-	-	-	-	5 701	
													-	2 104	3 530	3 546	2 351	231	-	-	-	-	-	11 762	

427623.9

Expenditures by Financiers (000 US\$)															
GCF Loan										BNDES/Government					
1	2	3	4	5	6	7	8	Total		1	2	3	4	5	6
-	4 271	9 965	9 965	4 271	-	-	-	28 473	-	-	4 680	10 921	10 921	4 680	-
-	-	-	-	-	-	-	-	-	-	-	601	2 083	3 033	2 253	703
-	4 271	9 965	9 965	4 271	-	-	-	28 473	-	-	5 281	13 004	13 954	6 934	703
-	-	-	-	-	-	-	-	-	-	-	53	125	125	53	-
-	-	-	-	-	-	-	-	-	-	-	30	104	152	113	35
-	-	-	-	-	-	-	-	-	-	-	83	229	276	166	35
-	3 492	3 492	3 492	3 492	-	-	-	13 968	-	-	-0	-0	-0	-0	-
-	-	-	-	-	-	-	-	-	-	-	751	1 562	1 625	1 690	879
-	-	-	-	-	-	-	-	-	-	-	49	103	107	111	58
-	3 492	3 492	3 492	3 492	-	-	-	13 968	-	-	801	1 665	1 732	1 801	937
-	7 763	13 457	13 457	7 763	-	-	-	42 440	-	-	6 165	14 898	15 962	8 901	1 675

Beneficiaries											
7	8	Total	1	2	3	4	5	6	7	8	Total
-	-	31 202	-	1 075	2 508	2 508	1 075	-	-	-	7 165
-	-	8 674	-	-	-	-	-	-	-	-	-
-	-	39 876	-	1 075	2 508	2 508	1 075	-	-	-	7 165
-	-	356	-	27	62	62	27	-	-	-	178
-	-	434	-	-	-	-	-	-	-	-	-
-	-	790	-	27	62	62	27	-	-	-	178
-	-	-0	-	499	499	499	499	-	-	-	1 995
-	-	6 507	-	-	-	-	-	-	-	-	-
-	-	428	-	-	-	-	-	-	-	-	-
-	-	6 935	-	499	499	499	499	-	-	-	1 995
-	-	47 600	-	1 600	3 069	3 069	1 600	-	-	-	9 339

Brazil

Planting Climate Resilience in rural communities of the Northeast

Table 3. Component 3. Knowledge management and scaling-up

Detailed Costs

Unit

Cost

(US\$

'000)

III. Output 3.1. CRPS and small-scale water harvesting system disseminated in the NEB semiarid											
A. Activity 3.1.1. Raise awareness and build capacities of women, youth and traditional commu											
Sub-activity 3.1.1.1. Develop a young communicators network											
Workshops for young communicators /a	Events	-	18	18	18	-	-	-	-	54	4,05
Inter-state exchange visits /b	Events	-	-	3	3	3	-	-	-	9	6,76
Inter-regional exchange visits /c	Events	-	-	12	12	12	-	-	-	36	2,70
Trainings for youths /d	Events	-	48	48	48	48	51	-	-	243	4,00
Learning scholarships for youths	Youth	-	-	198	198	198	-	-	-	594	1,62
Smartphones and equipments for young communicators	Youth	414	-	-	-	-	-	-	-	414	0,32
Laptops for youths	Number	6	-	-	-	-	-	-	-	6	0,95
Handbooks and other communication material	Number	-	-	-	8	8	8	-	-	24	12,16
Illustrated handbooks and guidelines	Number	-	-	10	10	10	-	-	-	30	9,54
Newsletters and bulletins	Number	-	-	14	14	14	14	14	-	70	0,95
Multimedia material / Videos	Number	-	-	-	4	4	4	-	-	12	13,51
Communication Equipment /e	Lumpsum/Office	12	-	-	3	-	-	-	-	15	2,46
Subtotal											
Sub-activity 3.1.1.2. Strengthen capacity for women, youth, and traditional communities											
Trainings for Women on sustainable technologies /f	Number	-	75	75	75	75	-	-	-	300	0,97
Workshops and meetings for Women /g	Number	-	72	72	72	72	72	-	-	360	0,97
Exchange visits for women /h	Number	-	3	2	2	2	2	1	-	12	3,41
Training for TA in Gender approach, race and ethnicity /i	Number	-	9	9	9	-	-	-	-	27	4,05
Case studies in traditional communities	Number	-	-	-	-	1	1	1	-	3	18,92
Childcare support activities	Lumpsum										
Subtotal											
Subtotal											
B. Activity 3.1.2. Drive scaling-up, unlock policy barriers and experiment with CRPS and resilie											
Sub-activity 3.1.2.1. Promote south-south cooperation											
National Learning Route / Exchange-Visit /j	Events	-	-	1	1	1	1	-	-	4	21,62
International Learning Route / Exchange visit (LAC) /k	Events	-	-	-	1	-	1	-	-	2	56,76
International Learning Route / Exchange Visit (Africa)	Events	-	-	-	1	-	-	-	-	1	78,38
Subtotal											
Sub-activity 3.1.2.2. Facilitate discussions to unlock policy barriers											
Legal studies	Number	1	1	1	1	1	1	1	1	8	20,00
Forums and Meetings at the federal level	Events	-	3	3	3	3	3	3	3	21	4,32
Technical Meetings at the regional and local level	Events	5	9	9	9	9	9	9	9	68	2,16
Gender Forum at the sub-project level	Events	-	3	3	3	3	3	3	3	21	2,16
Consultant / Advisor	person-month	-	-	12	12	12	12	12	12	72	2,16
Subtotal											
Sub-activity 3.1.2.3. Experiment with CRPS and resilience participatory monitoring model											
Events	Events	-	-	27	27	27	27	-	-	108	2,22
Subtotal											
C. Activity 3.1.3. Plan, Monitor, Evaluate and Learn											
Sub-activity 3.1.3.1. PMEL at National Level											
Knowledge Management- Information Platform /m	Lumpsum	-	-	-	-	-	1	-	-	1	12,16
Operating services	lumpsum										
Baseline and Impact Evaluation surveys /n	Number	-	1	-	-	-	-	-	1	2	225,00
Mid-term Evaluation	Number	-	-	-	-	1	-	-	-	1	100,00
GIS Evaluations	Number	-	4	-	-	4	-	-	4	12	7,51
Planning and Communication Services	lumpsum	1	1	1	1	1	1	1	1	8	14,67
IT and management inputs and services	lumpsum										
IT Services	lumpsum/yr	1	1	1	1	1	1	1	1	8	14,67
M&E Services	lumpsum	1	1	1	1	1	1	1	1	8	14,67
Project Completion Report	Number	-	-	-	-	-	-	-	1	1	18,92
M&E Meetings /o	Number	-	1	1	1	1	1	1	1	7	3,78
Planning Workshops	Number	-	1	1	1	1	1	1	1	7	3,78
Studies, Sistematizations and other KM products	Number	-	-	-	2	-	-	2	-	4	2,70
Subtotal											
Sub-activity 3.1.3.2. PMEL at State Level											
Studies, Sistematizations and other KM products to support MTR and PCR	Number	-	-	-	6	-	-	6	-	12	2,71
Planning Workshops	Number	-	3	3	3	3	3	3	3	21	3,78
Territorial Comitee Meetings	Number	-	3	3	3	3	3	3	3	21	1,89
M&E Meetings /p	Number	-	3	3	3	3	3	3	3	21	3,78
State-specific studies	Number	3	5	5	5	5	5	5	5	38	26,21
Subtotal											
Subtotal											
Total											

la Target: 414 youths

lb Target: 270 youths

lc Target: 414 youths

ld Target: 810 youths

le Recycling in yr 4

lf Target: 6.000 women / Including Nutrition and WASH training for TA in Gender approach, race and ethnicity and nutrition

lg Target: 9000 women

lh Target: 480 women

li Target: 810 participants.

lj 25 participants / each

lk 25 participants each

li Target: 2160 youths

lm Based on sistematizations and innovation experiences.

ln 1 in year 1, 1 in year 8- Including the PRO-WEAI Study and MDDW

lo 2 each year

lp 2 each year

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Summary Divisions									Other Accounts														
Totals Including Contingencies (000 US\$)									Expenditure		Disb.		IFAD										
1	2	3	4	5	6	7	8	Total	Component	Account	Acct.	Fin. Rule	1	2	3	4	5	6	7	8	Total		
-	79	82	85	-	-	-	-	246	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	-	23	24	25	-	-	-	71	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	-	36	38	39	-	-	-	114	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	208	216	225	234	258	-	-	1 140	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	-	321	321	321	-	-	-	963	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
140	-	-	-	-	-	-	-	140	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
6	-	-	-	-	-	-	-	6	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	-	-	114	118	123	-	-	355	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	-	107	112	116	-	-	-	335	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	-	15	15	16	17	17	-	81	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	-	-	63	66	68	-	-	197	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
31	-	-	9	-	-	-	-	39	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
176	287	801	1 006	935	467	17	-	3 689					-	-	-	-	-	-	-	-	-		
-	79	82	85	89	-	-	-	335	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	76	79	82	85	89	-	-	411	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	11	8	8	8	9	4	-	48	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	39	41	43	-	-	-	-	123	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	-	-	-	23	24	25	-	72	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	19	19	20	21	22	23	-	124	COMP3	GSI	GCS_C	GOVT	-	-	-	-	-	-	-	-	-		
-	224	229	238	226	143	52	-	1 113					-	-	-	-	-	-	-	-	-		
176	511	1 030	1 244	1 162	610	70	-	4 802					-	-	-	-	-	-	-	-	-		
-	-	24	25	26	27	-	-	103	COMP3	TAC	ENR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	-	-	66	-	72	-	-	138	COMP3	TAC	ENR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	-	-	92	-	-	-	-	92	COMP3	TAC	ENR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	-	24	183	26	99	-	-	333					-	-	-	-	-	-	-	-	-		
21	22	23	23	24	25	26	27	192	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	14	15	15	16	16	17	18	111	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
11	21	22	23	24	25	26	27	178	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	7	7	8	8	8	9	9	55	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	-	29	30	31	32	33	35	190	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
32	64	95	99	103	107	111	115	725					-	-	-	-	-	-	-	-	-		
-	-	68	70	73	76	-	-	287	COMP3	TAC	ENR_C	GOVT	-	-	-	-	-	-	-	-	-		
32	64	187	352	202	282	111	115	1 345					-	-	-	-	-	-	-	-	-		
58	58428.9												0	0	0	0	0	0	0	0	0		
-	-	-	-	-	15	-	-	15	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
25	57	62	67	75	82	41	-	409	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	243	-	-	-	-	-	308	552	COMP3	TAC	ENR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	-	-	-	122	-	-	-	122	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	33	-	-	37	-	-	41	110	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
15	16	17	17	18	19	19	20	141	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
95	-	-	4	-	-	-	-	99	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
15	16	17	17	18	19	19	20	141	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
15	16	17	17	18	19	19	20	141	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	-	-	-	-	-	-	26	26	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	4	4	4	5	5	5	5	32	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	4	4	4	5	5	5	5	32	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
-	-	-	6	-	-	7	-	13	COMP3	GSI	AWR_C	GCFG (100%)	-	-	-	-	-	-	-	-	-		
166	389	120	138	297	162	116	446	1 833					-	-	-	-	-	-	-	-	-		
-	-	-	19	-	-	21	-	40	COMP3	GSI	AWR_C	IFAD (100%)	-	-	-	16	-	-	18	-	33		
-	12	13	13	14	14	15	16	97	COMP3	GSI	AWR_C	IFAD (100%)	-	10	10	11	11	12	12	13	80		
-	6	6	7	7	7	7	8	48	COMP3	GSI	AWR_C	IFAD (100%)	-	5	5	5	6	6	6	6	40		
-	12	13	13	14	14	15	16	97	COMP3	GSI	AWR_C	IFAD (100%)	-	10	10	11	11	12	12	13	80		
80	139	145	150	156	163	169	176	1 178	COMP3	TAC	ENR_C	IFAD (100%)	66	114	119	123	128	133	139	144	966		
80	170	177	203	191	199	228	215	1 461					66	139	145	166	157	163	187	176	1 198		
246	559	297	341	487	361	344	660	3 294					66	139	145	166	157	163	187	176	1 198		
454	1 133	1 513	1 937	1 851	1 253	524	776	9 442					66	139	145	166	157	163	187	176	1 198		

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Planting Climate Resilience in rural communities of the Northeast

Table 4. Project Management

Detailed Costs

		Unit	1	2	3	4	5	6	7	8	Total	(US\$ '000)
I. Investment Costs												
A. Civil Works												
Refurbishment of Regional and Local PMU Offices /a	Lumpsum/office		3	5	2	2	-	-	-	-	12	13,51
B. Goods, services and inputs												
1. Inputs and equipments												
Laptops /b	Number		87	-	-	22	-	-	-	-	109	0,60
Smartphones /c	Number		87	-	-	22	-	-	-	-	109	0,25
Printers /d	Number		20	-	-	4	-	-	-	-	24	0,22
Vehicles and transportation /e	Number		12	-	-	-	-	-	-	-	12	27,03
Subtotal												
2. Workshops and trainings for PMU Staff	Events		-	12	12	12	12	12	-	-	60	2,85
3. Consultancies and studies												
Audits	Number		-	1	1	1	1	1	1	1	7	28,47
Subtotal												
Total Investment Costs												
II. Recurrent Costs												
A. Salaries												
1. State Level												
Project Manager	Pers.month		18	36	36	36	36	36	36	18	252	1,89
Project Assistant	Pers.month		18	36	36	36	36	36	36	18	252	0,73
Procurement Specialist	Pers.month		-	36	36	36	36	36	36	-	216	1,62
Accountant Specialist	Pers.month		-	72	72	72	72	72	72	-	432	1,62
Technical Analysts	Pers.month		-	108	108	108	108	108	108	-	648	1,08
Financial Management Specialist	Pers.month		18	36	36	36	36	36	36	18	252	1,62
Agroforestry and Resilient Production Specialist	Pers.month		-	36	36	36	36	36	36	-	216	1,62
Youth, Gender and traditional communities Specialist /f	Pers.month		-	36	36	36	36	36	36	-	216	1,62
Communication and Knowledge Management Specialist	Pers.month		-	36	36	36	36	36	36	-	216	1,62
M&E Specialist /g	Pers.month		18	36	36	36	36	36	36	18	252	1,62
M&E Analyst	Pers.month		18	36	36	36	36	36	36	18	252	1,22
Subtotal												
2. Field team												
Local PMU Supervisor	Pers.month		-	54	108	108	108	108	108	108	702	1,62
Agroforestry and Resilient Production Specialist	Pers.month		-	54	108	108	108	108	108	-	594	1,35
M&E Specialist	Pers.month		-	54	108	108	108	108	108	108	702	1,22
Communication and KM Specialist	Pers.month		-	54	108	108	108	108	108	-	594	1,22
Youth, gender and traditional communities specialist	Pers.month		-	54	108	108	108	108	108	-	594	1,22
Subtotal												
Subtotal												
B. Operating Costs at State and Local level												
Travel expenses	Office/Month		-	36	36	36	36	36	36	-	216	3,24
Transportation maintenance	Unit		-	3	6	6	12	12	-	-	39	2,16
Transportation Insurance	Unit		-	6	12	12	12	12	12	6	72	2,70
Office operating expenses	Office/month		-	132	132	132	132	132	132	-	792	1,61
Services and Utilities	Office/Month		-	132	132	132	132	132	132	-	792	2,16
Subtotal												
Total Recurrent Costs												
Total												

\a 12 Offices with different needs during the first 4 years

\b 1 laptop per PMU staff, and 25% replaced in Yr4, Total 87 persons, 42 at the State level and 45 at the local level (29 persons per State)

\c 1 smartphone per PMU staff, and 25% replaced in Yr4, Total 87 persons, 42 at the State level and 45 at the local level (29 persons per State)

\d 1 for 4 and 1/4 recycling in yr 4

\e 1 for each PMU office- recycling in yr 4

\f Including Nutrition

\g Including Planning

Annex 4 - PCR Detailed budget plan v040920.xlsx

Totals Including Contingencies (000 US\$)									Other Accounts		GCF Grant					
1	2	3	4	5	6	7	8	Total	Disb. Acct.	Fin. Rule	1	2	3	4	5	6
42	73	30	32	-	-	-	-	177	PM_C	GOVT	-	-	-	-	-	-
54	-	-	15	-	-	-	-	70	PM_C	GOVT	-	-	-	-	-	-
23	-	-	6	-	-	-	-	29	PM_C	GOVT	-	-	-	-	-	-
4	-	-	1	-	-	-	-	6	PM_C	GOVT	-	-	-	-	-	-
337	-	-	-	-	-	-	-	337	PM_C	GOVT	-	-	-	-	-	-
419	-	-	23	-	-	-	-	442			-	-	-	-	-	-
-	37	38	40	42	43	-	-	200	PM_C	GOVT	-	-	-	-	-	-
-	30	31	33	34	35	37	38	239	PM_C	GCFG (100%)	-	30	31	33	34	35
419	67	70	96	76	79	37	38	881			-	30	31	33	34	35
461	140	100	127	76	79	37	38	1 058			-	30	31	33	34	35
34	68	68	68	68	68	68	34	477	PM_C	GOVT	-	-	-	-	-	-
13	26	26	26	26	26	26	13	184	PM_C	GOVT	-	-	-	-	-	-
-	58	58	58	58	58	58	-	350	PM_C	GOVT	-	-	-	-	-	-
-	117	117	117	117	117	117	-	701	PM_C	GOVT	-	-	-	-	-	-
-	117	117	117	117	117	117	-	701	PM_C	GOVT	-	-	-	-	-	-
29	58	58	58	58	58	58	29	409	PM_C	GOVT	-	-	-	-	-	-
-	58	58	58	58	58	58	-	350	PM_C	GOVT	-	-	-	-	-	-
-	58	58	58	58	58	58	-	350	PM_C	GOVT	-	-	-	-	-	-
-	58	58	58	58	58	58	-	350	PM_C	GOVT	-	-	-	-	-	-
29	58	58	58	58	58	58	29	409	PM_C	GOVT	-	-	-	-	-	-
22	44	44	44	44	44	44	22	306	PM_C	GOVT	-	-	-	-	-	-
127	722	722	722	722	722	722	127	4 587			-	-	-	-	-	-
-	88	175	175	175	175	175	175	1 138	PM_C	GOVT	-	-	-	-	-	-
-	73	146	146	146	146	146	-	803	PM_C	GOVT	-	-	-	-	-	-
-	66	131	131	131	131	131	131	854	PM_C	GOVT	-	-	-	-	-	-
-	66	131	131	131	131	131	-	722	PM_C	GOVT	-	-	-	-	-	-
-	66	131	131	131	131	131	-	722	PM_C	GOVT	-	-	-	-	-	-
-	358	715	715	715	715	715	306	4 240			-	-	-	-	-	-
127	1 080	1 437	1 437	1 437	1 437	1 437	434	8 826			-	-	-	-	-	-
-	130	135	141	146	152	158	-	863	PM_C	GOVT	-	-	-	-	-	-
-	7	15	16	33	34	-	-	104	PM_C	GOVT	-	-	-	-	-	-
-	18	38	39	41	42	44	23	244	PM_C	GOVT	-	-	-	-	-	-
-	237	247	256	267	277	288	-	1 572	PM_C	GOVT	-	-	-	-	-	-
-	318	331	344	358	372	387	-	2 109	PM_C	GOVT	-	-	-	-	-	-
-	710	765	796	844	877	877	23	4 892			-	-	-	-	-	-
127	1 790	2 202	2 233	2 281	2 314	2 314	457	13 718			-	-	-	-	-	-
589	1 930	2 302	2 360	2 356	2 393	2 351	495	14 777			-	30	31	33	34	35

Expenditures by Financiers (000 US\$)											
BNDES/Government											
7	8	Total	1	2	3	4	5	6	7	8	Total
-	-	-	42	73	30	32	-	-	-	-	177
-	-	-	54	-	-	15	-	-	-	-	70
-	-	-	23	-	-	6	-	-	-	-	29
-	-	-	4	-	-	1	-	-	-	-	6
-	-	-	337	-	-	-	-	-	-	-	337
-	-	-	419	-	-	23	-	-	-	-	442
-	-	-	-	37	38	40	42	43	-	-	200
37	38	239	-	-	-	-	-	-	-	-	-
37	38	239	419	37	38	63	42	43	-	-	642
37	38	239	461	110	69	95	42	43	-	-	820
-	-	-	34	68	68	68	68	68	68	34	477
-	-	-	13	26	26	26	26	26	26	13	184
-	-	-	-	58	58	58	58	58	58	-	350
-	-	-	-	117	117	117	117	117	117	-	701
-	-	-	-	117	117	117	117	117	117	-	701
-	-	-	29	58	58	58	58	58	58	29	409
-	-	-	-	58	58	58	58	58	58	-	350
-	-	-	-	58	58	58	58	58	58	-	350
-	-	-	-	58	58	58	58	58	58	-	350
-	-	-	29	58	58	58	58	58	58	29	409
-	-	-	22	44	44	44	44	44	44	22	306
-	-	-	127	722	722	722	722	722	722	127	4 587
-	-	-	-	88	175	175	175	175	175	175	1 138
-	-	-	-	73	146	146	146	146	146	-	803
-	-	-	-	66	131	131	131	131	131	131	854
-	-	-	-	66	131	131	131	131	131	-	722
-	-	-	-	66	131	131	131	131	131	-	722
-	-	-	-	358	715	715	715	715	715	306	4 240
-	-	-	127	1 080	1 437	1 437	1 437	1 437	1 437	434	8 826
-	-	-	-	130	135	141	146	152	158	-	863
-	-	-	-	7	15	16	33	34	-	-	104
-	-	-	-	18	38	39	41	42	44	23	244
-	-	-	-	237	247	256	267	277	288	-	1 572
-	-	-	-	318	331	344	358	372	387	-	2 109
-	-	-	-	710	765	796	844	877	877	23	4 892
-	-	-	127	1 790	2 202	2 233	2 281	2 314	2 314	457	13 718
37	38	239	589	1 900	2 271	2 327	2 322	2 358	2 314	457	14 538

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Planting Climate Resilience in rural communities of th
Disbursement Accounts by Financiers
(US\$ '000)

	IFAD		GCF Loan		GCF Grant		BNDES/Government		Beneficiaries		Total		For. Exch.	Local (Excl. Taxes)	Duties & Taxes		
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%					
Environment and Natural Resources	16 348.4	51.8	8 830	28.0	885	2.8	4 511	14.3	981	3.1	31 555	14.5	-	27 940	3 615		
Climate Resilience	1 657.3	3.2	13 729	26.0	31 370	59.5	972	1.8	5 013	9.5	52 742	24.2	-	52 467	275		
Agricultural Water Resources	11 994.3	10.6	42 440	37.4	2 007	1.8	47 651	42.0	9 339	8.2	113 432	52.1	-	110 186	3 246		
Government and Civil Society	-	-	-	-	-	-	5 328	100.0	-	-	5 328	2.4	-	4 564	763		
Programme Management /a	-	-	-	-	239	1.6	14 538	98.4	-	-	14 777	6.8	-	13 748	1 028		
Total PROJECT COSTS	30 000.0	13.7	65 000	29.8	34 500	15.8	73 000	33.5	15 333	7.0	217 833	100.0	-	208 905	8 928	202 500	0.072970531
				45.6													0.560846561
																	0.824074074

/a including maintenance

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Planting Climate Resilience in rural communities of the Northeast

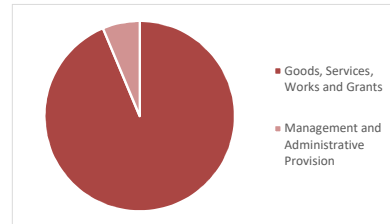
Expenditure Accounts by Financiers
(US\$ '000)

	IFAD		GCF Loan		GCF Grant		BNDES/Government		Beneficiaries		Total		For. Exch.	Local (Excl. Taxes)	Duties & Taxes
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%			
I. Investment Costs															
A. Consultancies and Technical Assistance	18 825.4	45.6	-	-	1 083	2.6	21 354	51.8	-	-	41 263	18.9	-	34 082	7 181
B. Funds for Productive Development Plans	10 942.6	7.1	65 000	42.0	31 171	20.1	32 255	20.8	15 333	9.9	154 702	71.0	-	154 702	-
C. Civil works, goods, services and inputs	232.0	2.8	-	-	2 246	27.6	5 673	69.6	-	-	8 150	3.7	-	7 283	867
Total Investment Costs	30 000.0	14.7	65 000	31.8	34 500	16.9	59 282	29.0	15 333	7.5	204 115	93.7	-	196 067	8 048
II. Recurrent Costs	0	0													
D. Management and Administrative Provision	-	-	-	-	-	-	13 718	100.0	-	-	13 718	6.3	-	12 838	881
Total Recurrent Costs	-	-	-	-	-	-	13 718	100.0	-	-	13 718	6.3	-	12 838	881
Total PROJECT COSTS	30 000.0	13.7	65 000	29.8	34 500	15.8	73 000	33.5	15 333	7.0	217 833	100.0	-	208 905	8 928

202 500.000

	IFAD 11	IFAD 12	GCF Loan	GCF Grant	Government	Beneficiaries
A. Consultancies and Technical Assistance	19	7.4	38.2	-	2.6	51.8
B. Funds for Productive Development Plans	71	5.0	2.1	42.0	20.1	9.9
C. Civil works, goods, services and inputs	4	2.4	0.4	-	27.6	69.6
D. Management and Administrative Provision	6	-	-	-	100.0	-

Goods, Services, Works and Grants	94
Management and Administrative Provision	6



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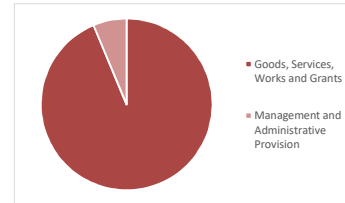
Planting Climate Resilience in rural communities of the Northeast

Expenditure Accounts by Financiers (US\$ '000)														For.	Local	Duties &	
IFAD 11		IFAD		GCF Loan		GCF Grant		BNDES/Government		Beneficiaries		Total		Exch.	(Excl. Taxes)	Taxes	
Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%				
I. Investment Costs																	
A. Consultancies and Technical Assistance	3 066	7.4		-	-	1 083	2.6	21 354	51.8	-	-	41 263	18.9	-	34 082	7 181	
B. Funds for Productive Development Plans	7 735	5.0		65 000	42.0	31 171	20.1	32 255	20.8	15 333	9.9	154 702	71.0	-	154 702	-	
C. Civil works, goods, services and inputs	199	2.4		-	-	2 246	27.6	5 673	69.6	-	-	8 150	3.7	-	7 283	867	
Goods, Services, Works and Grants	11 000	5.4	30 000.0	14.7	65 000	31.8	34 500	16.9	59 282	29.0	15 333	7.5	204 115	93.7	-	196 067	8 048
II. Recurrent Costs																	
Management and Administrative Provision	-	-	-	-	-	-	-	13 718	100.0	-	-	13 718	6.3	-	12 838	881	
Total Recurrent Costs	-	-	-	-	-	-	-	13 718	100.0	-	-	13 718	6.3	-	12 838	881	
Total PROJECT COSTS	11 000	5.0	30 000.0	13.7	65 000	29.8	34 500	15.8	73 000	33.5	15 333	7.0	217 833	100.0	-	208 905	8 928

202 500.000

	IFAD 11	IFAD 12	GCF Loan	GCF Grant	overment	Beneficiaries
A. Consultancies and Technical Assistance	19	7.4	38.2	-	2.6	51.8
B. Funds for Productive Development Plans	71	5.0	2.1	42.0	20.1	20.8
C. Civil works, goods, services and inputs	4	2.4	0.4	-	27.6	69.6
Management and Administrative Provision	6	-	-	-	100.0	-

Goods, Services, Works and Grants	94
Management and Administrative Provision	6



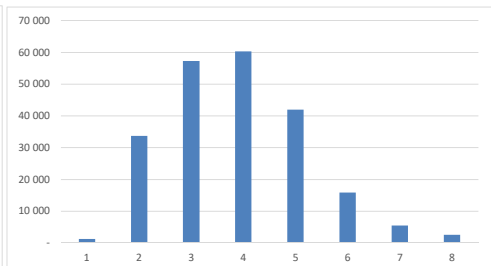
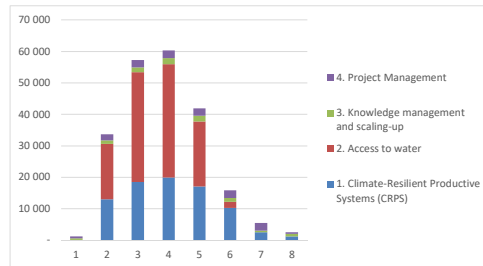
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Planting Climate Resilience in rural communities of the North

Project Components by Year -- Totals Including Conting

Project Components by Year -- Totals Including Conting	Totals Including Contingencies (R\$ '000)									Totals Including Contingencies (US\$ '000)								
	1	2	3	4	5	6	7	8	Total	1	2	3	4	5	6	7	8	Total
1. Climate-Resilient Productive Systems (CRPS)	451	54 382	77 489	83 598	71 677	43 019	10 680	5 089	346 386	107	12 948	18 450	19 904	17 066	10 243	2 543	1 212	82 473
2. Access to water	-	74 058	146 807	151 345	86 583	8 004	-	-	466 797	-	17 633	34 954	36 035	20 615	1 906	-	-	111 142
3. Knowledge management and scaling-up	1 907	4 760	6 356	8 136	7 775	5 261	2 202	3 259	39 656	454	1 133	1 513	1 937	1 851	1 253	524	776	9 442
4. Project Management	2 472	8 106	9 670	9 912	9 897	10 051	9 875	2 079	62 061	589	1 930	2 302	2 360	2 356	2 393	2 351	495	14 777
Total PROJECT COSTS	4 831	141 306	240 322	252 991	175 932	66 334	22 757	10 427	914 900	1 150	33 644	57 220	60 236	41 889	15 794	5 418	2 483	217 833

1. Climate-Resilient Productive Systems (CRPS)	107	12 948	18 450	19 904	17 066	10 243	2 543	1 212
2. Access to water	-	17 633	34 954	36 035	20 615	1 906	-	-
3. Knowledge management and scaling-up	454	1 133	1 513	1 937	1 851	1 253	524	776
4. Project Management	589	1 930	2 302	2 360	2 356	2 393	2 351	495



Brazil

Planting Climate Resilience in rural communities of the Northeast

Components by Financiers

(US\$ '000)	IFAD		GCF Loan		GCF Grant		BNDES/Government		Beneficiaries		Total		For. Exch.	Local (Excl. Taxes)	Duties & Taxes	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%				
1. Climate-Resilient Productive Systems (CRPS)	17 039.5	20.6	22 560	27.4	31 370	38.0	5 510	6.7	5 994	7.3	82 473	37.9	-	78 700	3 773	
2. Access to water	11 762.3	10.5	42 440	38.2	-	-	47 600	42.8	9 339	8.4	111 142	51.0	-	107 947	3 196	
3. Knowledge management and scaling-up	1 198.2	12.7	-	-	2 892	30.6	5 352	56.7	-	-	9 442	4.3	-	8 510	932	
4. Project Management	-	-	-	-	239	1.6	14 538	98.4	-	-	14 777	6.8	-	13 748	1 028	0.069576553
Total Project Costs	30 000.0	13.7	65 000	29.8	34 500	15.8	73 000	33.5	15 333	7.0	217 833	100.0	-	208 905	8 928	202 500.000

37.9

51

4.3

6.8

Annex 4 - PCR Detailed budget plan v040920.xlsx

Brazil

Planting Climate Resilience in rural co

Financing of Investment/Recurrent

(US\$ '000)

	Financing								
	1	2	3	4	5	6	7	8	Total
I. Investment Costs									
IFAD	103	3 661	6 265	7 303	5 750	3 477	2 272	1 170	30 000
GCF Loan	-	11 313	20 328	20 328	13 031	-	-	-	65 000
GCF Grant	198	6 931	6 839	7 040	6 539	6 091	264	599	34 500
BNDES/Government	722	7 260	17 022	18 769	11 406	3 277	568	257	59 282
Beneficiaries	-	2 690	4 564	4 564	2 881	635	-	-	15 333
Total Investment Costs	1 023	31 855	55 018	58 003	39 608	13 479	3 104	2 026	204 115
II. Recurrent Costs									
IFAD 11	-	-	-	-	-	-	-	-	-
IFAD 12	-	-	-	-	-	-	-	-	-
GCF Loan	-	-	-	-	-	-	-	-	-
GCF Grant	-	-	-	-	-	-	-	-	-
BNDES/Government	127	1 790	2 202	2 233	2 281	2 314	2 314	457	13 718
Beneficiaries	-	-	-	-	-	-	-	-	-
Total Recurrent Costs	127	1 790	2 202	2 233	2 281	2 314	2 314	457	13 718
III. Financial Charges									
IFAD 11	-	-	-	-	-	-	-	-	-
IFAD 12	-	-	-	-	-	-	-	-	-
GCF Loan	-	-	-	-	-	-	-	-	-
GCF Grant	-	-	-	-	-	-	-	-	-
BNDES/Government	-	-	-	-	-	-	-	-	-
Beneficiaries	-	-	-	-	-	-	-	-	-
Total Financial Charges	-	-	-	-	-	-	-	-	-
Total Financing of Costs	1 150	33 644	57 220	60 236	41 889	15 794	5 418	2 483	217 833

Brazil									
Planting Climate Resilience in rural communities of the North									
Components Project Cost Summary									
	(R\$ '000)			(US\$ '000)			% Foreign Exchange	% Total Base Costs	Exchange rate
	Local	Foreign	Total	Local	Foreign	Total			
1. Climate-Resilient Productive Systems (CRPS)	343 565	-	343 565	81 801	-	81 801	-	39	4.5
2. Access to water	455 883	-	455 883	108 544	-	108 544	-	51	
3. Knowledge management and scaling-up	34 374	-	34 374	8 184	-	8 184	-	4	
4. Project Management	57 749	-	57 749	13 750	-	13 750	-	6	
Total BASELINE COSTS	891 571	-	891 571	212 279	-	212 279	-	100	202 500
Physical Contingencies	4 216	-	4 216	1 004	-	1 004	-	-	
Price Contingencies	19 113	-	19 113	4 551	-	4 551	-	2	
Total PROJECT COSTS	914 900	-	914 900	217 833	-	217 833	-	103	2.7%

5 555

2.5%

5 555

0.025499598

Brazil

Planting Climate Resilience in rural communities of the Northeast
Expenditure Accounts by Components - Totals Including Co
 (US\$ '000)

	Climate- Resilient Systems (CRPS)	Access to water	Knowledge management and scaling-up	Project Management	Total
I. Investment Costs					
A. Consultancies and Technical Assistance	21 160	17 753	2 350	-	41 263
B. Funds for Productive Development Plans	61 313	93 389	-	-	154 702
C. Civil works, goods, services and inputs	-	-	7 092	1 058	8 150
Total Investment Costs	82 473	111 142	9 442	1 058	204 115
II. Recurrent Costs					
A. Management and Administrative Provision	-	-	-	13 718	13 718
Total Recurrent Costs	-	-	-	13 718	13 718
Total PROJECT COSTS	82 473	111 142	9 442	14 777	217 833
Taxes	3 773	3 196	932	1 028	8 928
Foreign Exchange	-	-	-	-	-

Expenditure Acc.	Component 1	Component 2	Component 3	PMU	Total
Good, Services, Works and Grants	82 473	111 142	9 442	1 058	204 115
Management and administrative provision	-	-	-	13 718	13 718
Total	82 473	111 142	9 442	14 777	217 833

Brazil

Planting Climate Resilience in rural communities of the Northeast

Expenditure Accounts by Years -- Totals Including Contingen

Expenditure Accounts by Years -- Totals Including Contingen	Totals Including Contingencies (US\$ '000)								
	1	2	3	4	5	6	7	8	Total
I. Investment Costs									
A. Consultancies and Technical Assistance	188	3 525	7 588	10 290	9 129	6 135	2 712	1 696	41 263
B. Funds for Productive Development Plans	-	27 438	46 053	46 053	28 807	6 351	-	-	154 702
C. Civil works, goods, services and inputs	835	891	1 377	1 660	1 671	993	392	330	8 150
Total Investment Costs	1 023	31 855	55 018	58 003	39 608	13 479	3 104	2 026	204 115
II. Recurrent Costs									
A. Management and Administrative Provision	127	1 790	2 202	2 233	2 281	2 314	2 314	457	13 718
Total Recurrent Costs	127	1 790	2 202	2 233	2 281	2 314	2 314	457	13 718
Total PROJECT COSTS	1 150	33 644	57 220	60 236	41 889	15 794	5 418	2 483	217 833

	COSTAB	TEMPLATE	CHECK
A. Climate Resilient Productive Systems in the Semiarid	#REF!	82 472 786	#REF!
B. Increase water storage capacity of family farms	#REF!	111 142 137	#REF!
C. Knowledge Management and Social Communication	#REF!	9 441 911	#REF!
D. Project Management	#REF!	14 776 533	#REF!
Total Project Costs	#REF!	217 833 367	#REF!

#REF! 15333366.51

Estimativo dos Custos do Projeto por Componente por financiador

	IFAD		GCF		Government		Beneficiaries		Total	
Item	U\$S Million	%	U\$S Million	%	U\$S Million	%	U\$S Million	%	U\$S Million	%
Component 1	17.04	21	53.93	65	5.51	7	6.0	7	82.47	38
Component 2	11.76	11	42.44	38	47.60	43	9	8	111.14	51
Component 3	1.20	13	2.89	31	5.35	57	-	-	9.44	4
PMU	-	-	0.24	2	14.54	98	-	-	14.78	7
Total	30	13.8	99.5	46	73	34	15	7	217.8	100

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100

100

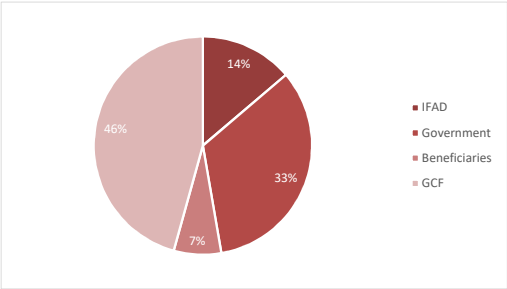
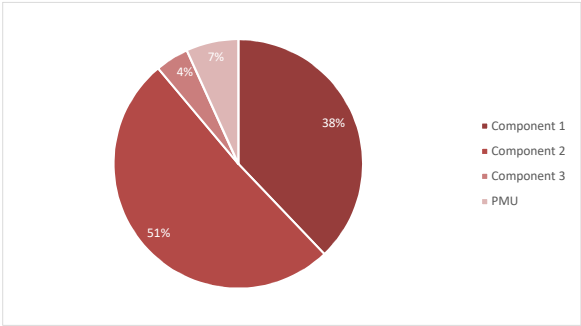
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	%
IFAD	13.77
Government	33.51
Beneficiaries	7.04
GCF	45.68



Estimativo dos Custos do Projeto por Financiador

Item	U\$S Million	R\$ Million	%
IFAD	30.0	135.0	13.8
GCF Loan	65.0	292.5	29.8
GCF Grant	34.5	155.3	15.8
Government	73.0	328.5	33.5
Beneficiaries	15.3	69.0	7.0
Total	217.8	980.3	100.0

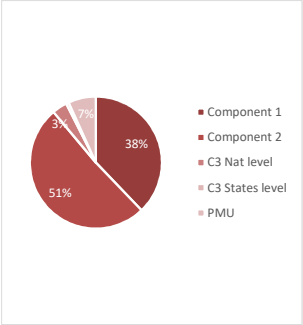
Estimativo dos Custos do Projeto por Financiador

Item	U\$S Million	R\$ Million	%
IFAD 11	11	50	5
IFAD 12	19	86	9
GCF Loan	65	293	30
GCF Grant	34.5	155	16
Government	73	329	34
Beneficiaries	15.3	69	7
Total	217.8	980	100

Estimativo dos Custos do Projeto por Componente

Item	U\$S Million	R\$ Million	%
Component 1	82.47	371	37.9
Component 2	111.14	500	51.0
Component 3	9.442	42	4.3
PMU	14.78	66	6.8
Total	217.83	980	100

Item	J\$S Millior	R\$ Million	%
Component 1	82.47	371	38
Component 2	111.14	500	51
C3 Nat level	7.98	36	4
C3 States level	1.46	7	1
PMU	14.78	66	7
Total	217.83	980	100



Component/ Subcomponent	IFAD		GCF loan		GCF Grant		Government/BNDES		Total		
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	
	US\$ Millions		US\$ Millions		US\$ Millions		Cash	In-kind	US\$ Millions		
Component 1	17 030 512	57	22 555 364	35	31 569 547	51	5 569 687	-	8	76 478 311	39
#REF!	17 030 512		22 555 364		31 569 547		5 569 687		8	76 478 311	
Component 2	11 762 310	38	42 440 436	66	-	-	47 600 920	60	101 803 245	50	
#REF!	11 762 310		42 440 436		-		47 600 920		101 803 245		
Component 3	1 198 105	4	-	-	2 891 912	5	5 351 851	7	3 441 911	3	
#REF!	1 198 105		-		2 891 912		5 351 851		3 441 911		
PMU	-	-	-	-	238 041	1	15 587 886	20	14 738 533	1	
#REF!	-		-		238 041		15 587 886		14 738 533		
Total	30 000 000		65 000 000		34 500 000		11 950 000	-	205 000 000		

Check

187 723 468

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22.54

#REF!

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79513.50556

Expenditure category	IFAD		GCF loan		GCF Grant		Government/BNDES		Beneficiaries		Total	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
	US\$ Millions		US\$ Millions		US\$ Millions		Cash	In-kind	In-kind		US\$ Millions	
#REF!	30 000	15	65 000	32	34 500	17	59 282	29.0	15 333	8	204 115	94%
#REF!	30 000		65 000		34 500		59 282		15 333		204 115	
Total	30 000	14	65 000	30	34 500	16	73 000	34	15 333	7	217 833	

204 115.01

13 718.35

#REF!

46.1

217 833

Componente	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Total
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	
Componente 1.	107	0	12 949	16	18 450	22	19 904	24	17 066	21	10 243	12	2 543	3	1 212	1	82 473
Componente 2.	0	0	17 632	16	24 954	31	26 025	32	20 615	19	1 906	2	0	0	0	0	131 142
Componente 3.	454	5	1 133	12	1 513	16	1 937	21	1 851	20	1 253	13	524	6	776	8	9 442
PMU	589	4	1 930	15	2 302	16	2 369	16	2 356	16	2 393	16	2 351	16	496	3	14 777
Total	1 150	1	33 645	15	57 220	26	60 236	29	51 889	19	35 754	7	5 318	2	2 583	1	217 833

100

0.3766

20.8

100

0.5102

61.6

100

0.0433

17.6

100

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Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex 5: Social Environment and Climate Assessment (SECAP) Review Note

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

Brazil

Planting Resilience in Rural Communities of the Brazilian Semiarid (PCRP)

Project Design Report

Annex 5: SECAP Review Note

Document Date: 30/09/2020

Project No. 2000002253

Latin America and the Caribbean Division
Programme Management Department

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1. EXECUTIVE SUMMARY

The project will take place in the semiarid region of Northeast Brazil (NEB), a region with a population of 21.3 million people (12% of the national population).¹ The states in this region are home to the poorest population in the country; IFAD has been supporting rural development there for the past 25 years. The Northeast region has experienced periodic droughts and chronic problems related to water scarcity. Nonetheless, the 2011–2016 drought that affected this region is considered the worst in the past 100 years; it has exacerbated many social problems through farmers' indebtedness, migration, disease, and malnutrition.^{2,3} Estimated economic losses from the drought event in the agricultural sector alone are on the order of US\$ 6 billion.⁴

Family farmers are the most affected by climate change. There is a significant correlation between average precipitation and agricultural production, but statistically, the effect is significantly higher for crops produced by family farmers than average agricultural production. The average crop area lost due to droughts from 1990 to 2016 was 221,973 hectares per year.⁵

The Planting Climate Resilience in rural communities of the Northeast (PCRP) project will work towards paradigm shift: it is possible to transform family farmers' productive systems in the semiarid NEB by increasing production while simultaneously improving farmers' capacity to face the challenges posed by ongoing climate change. The project will result in resilient and productive farming systems performing restored ecosystem functions, which, in turn, both increase and stabilize family income and food security while incentivizing young generations to stay active in rural activities. The partnerships between IFAD, GCF, the Government of Brazil (GoB), and BNDES will mobilize resources and disseminate lessons to many levels of government in other regions in Brazil and abroad.

The project will consist of three components that reinforce one another to promote climate resiliency as well as emission mitigation: 1) Climate Resilient Productive Systems (CRPS); 2) Water access; and 3) Knowledge Management and Scaling-Up.

The project will directly benefit a total of approximately 1,000,000 people in 250,000 family farms (of which 40% are women and 50% youth), increase the resilience of agricultural production systems over 84,124 ha and restore degraded ecosystems of importance for the provision of environmental services. It will increase the water access to 36,000 families, increasing their resilience to droughts. The project will mitigate between 11 086 999 tCO₂eq and 11 621 173 tCO₂eq over a 20 years period.

The project is included in the Brazilian National Strategy for the Green Climate Fund and is aligned with the Brazilian National Policy on Climate Change, Nationally Determined Contribution (NDC), programs to strengthen family agriculture (such as PRONAF), the National Plan for Food and Nutrition Security, the National Policy for the Sustainable Development of Traditional Peoples and Communities, and the Food Purchase Program. It has been approved by the Commission for External Financing (COFIEX) of the Ministry of Economy in September 2019 and received the No Objection from the National Designated Authority (NDA) within the Ministry of Economy, confirming its alignment with national development priorities and strategies.

Stakeholder engagement was guided by subsidies derived from the empirical reality, captured from field visits to communities in the semiarid region of the Northeast States and through meetings and public consultations with potential stakeholders, both governmental and non-governmental organizations. The design team (i) held a series of field visits to the semiarid states of Bahia and Pernambuco; (ii) A series of meetings where held with Federal

1 Banco do Nordeste, O Novo Perfil do Nordeste Brasileiro no Censo Demográfico 2010 : https://www.bnb.gov.br/documentos/88765/89729/novo_perfil_nordeste_brasileiro_censo_demografico_2010.pdf/34cfcc2e-1048-4dc1-9342-46b13eda208b

2 Gutiérrez APA, Engle NL, De Nys E, Molejon C, Martins ES (2014) Drought preparedness in Brazil. *Weather Clim Extremes* 3:95– 106. doi:10.1016/j.wace.2013.12.001

3 Marengo, Jose A., et al. "Climatic characteristics of the 2010-2016 drought in the semiarid Northeast Brazil region." *Anais da Academia Brasileira de Ciências* 90.2 (2018): 1973-1985.

4 Marengo, J. A., et.al, "Drought in Northeast Brazil—past, present, and future." *Theoretical and Applied Climatology* 129.3-4 (2017): 1189-1200.

5 Young, C.E. et. Al.. Drought in the Brazilian Semi-Arid. Study commissioned by IFAD (please see Annex 23)

Government institutions in Brasília, such as the Secretariat of Family Agriculture and Agrarian Development (SEAD), the Ministry of Social Development (MDS) - actual Ministry of Citizenship (MC), the Ministry of the Environment (MMA), the Secretariat of International Affairs (SAIN), the Ministry of Science, Technology, Innovation and Communications (MCTIC), and the General Coordination of Policies for Women, Youth, Peoples and Traditional Communities (CEGAT); and (iii) two public consultations.

The current document, the Social, Environmental and Climate Assessment Procedures (SECAP), is IFAD's social and environmental safeguard instrument, equivalent to IFC's Environmental Social Management Framework (ESMF). It is an overarching framework for achieving improvements in environmental and social outcomes while addressing any unintended adverse impacts of the project's activities.

The project is classified as Category B. The Project has minor to moderate risks of adverse environmental impacts. The main impacts that can be caused by this project activities are (i) Pressure on land ownership, (ii) Irregular occupation of indigenous lands, quilombolas or settlement, (iii) Erosion processes induction and soil impoverishment, (iv) Contamination of water resources and soil, (v) Interferences with vegetation, (vi) Increased scarcity of water resources, (vii) Increase in salt content of the soil, (viii) Gender discrimination, and (ix) Impact on the health and safety of farmers.

All possible impacts are reversible in nature, and can be readily remedied by appropriate preventive actions and/or mitigation measures as outlined in the ESMP. PCRP project does not envisage adverse social impact and a free and prior informed consultation (FPIC) plan has been developed (see Appendix I) to ensure indigenous people's participation in project development and to prevent any potential conflict during implementation.

2. INTRODUCTION

The International Fund for Agricultural Development (IFAD) and the Government of Brazil (GoB), and the Brazilian Development Bank (BNDES) are committed to enhancing environmental sustainability and climate resilience for families in Northeastern Brazil (NEB). Family agriculture plays a major role in the Brazilian economy as a generator of income and employment.

The Planting climate resilience in rural communities of the Northeast (PCRP) project will work to transform poor family farmers' productive systems in the semiarid by increasing production while simultaneously improving their capacity to face the challenges posed by ongoing climate change. The project will result in resilient and productive farming systems and restored ecosystem functions, increasing and stabilizing family income and food security and nutrition, while supporting young generations to stay active in rural activities. The partnership between IFAD, GCF, the GoB, and BNDES will mobilize resources and disseminate lessons to many levels of government and other regions in Brazil.

PCRP will enable farmers to take a longer-term perspective in anticipation of the significant financial, economic and livelihood benefits achievable through the application of adaptation measures relative to the declines in production and income that are anticipated to result from the effects of climate change. It responds to the urgency which climate change projections give to the application of these practices, and recognizes that for them to function effectively as adaptation measures, they must be applied as part of a larger scale program and be directed and adjusted considering the needs, priorities and cultural specificities, both regional and at the level of family productive units.

The project components aim to contribute to overcome the barriers faced by the family farmers in their agriculture, animal husbandry, extractivism and productive activities. While the practices to be supported have the potential to yield sustainable land management benefits and increase production, they require a social and environmental safeguards to be in place to avoid unintended consequences.

The current document, the Social, Environmental and Climate Assessment Procedures (SECAP), is IFAD's social and environmental safeguard instrument, equivalent to IFC's Environmental Social Management Framework (ESMF). It is an overarching framework for achieving improvements in environmental and social outcomes while addressing any unintended adverse impacts of the project's activities.

The SECAP goes beyond the social and environmental considerations to include climate impacts associated with projects and programs. It mainstreams environmental, social and climate change considerations into the project cycle, and demonstrates IFAD's commitment to go beyond "doing no harm" to maximizing development gains. It also seeks to ensure that IFAD's policies and strategies and its investments are designed to leave no one behind since sustainable development must be achieved for all – especially the poorest and most vulnerable to climate change.

The SECAP aims to:

- set a priority to adopt guiding values and principles to promote high social, environmental and climate adaptation benefits;
- define the process and suitable entry points in the project cycle; mainstreaming social, environmental and climate adaptation sustainability considerations into all its activities; and
- ensure effective stakeholder engagement, including a procedure to respond to alleged complaints from project-affected individuals.

The SECAP is underpinned by IFAD's Policy on the Disclosure of Documents and IFAD Complaints Procedures (to respond to alleged complaints of non-compliance with IFAD's environmental and social policies and mandatory elements of SECAP).

Likewise, the GCF has a safeguard system that had been adopted from the International Finance Corporation (IFC) Performance Standards as its safeguard standards on an interim basis. In addition, it adopted requirements related to gender. The IFC Performance Standards (PS) are widely recognized as good practice in the international community. The Performance Standards consist of one overarching standard (PS 1) and seven standards covering specific issue areas (PS 2-8). PS 1 covers the elements that need to be in place to help ensure that the remaining seven standards are implemented. Together these elements are called the environmental and social management system (ESMS).

According to the GCF the environmental and social management system of the accredited entities needs to be in accordance with the requirements of the GCF ESS standards and applicable policies of GCF as determined in the accreditation and appropriate to its role as an implementing entity. Therefore, institutions seeking to be accredited to the GCF need to be able to show that they can implement the Performance Standards or comply with those standards and the GCF Gender Policy.

IFAD has gone through a fit-for-purpose approach accreditation process in which its own safeguards (SECAPs) have been validated to comply with International Finance Corporation (IFC) Performance Standards. The accreditation process considered the capacity, competency and track record of IFAD in applying its own environmental and social safeguards, and the consistency with the GCF ESS standard. As a result, IFAD was accredited with the GCF as a grant and loan implementing entity for medium-sized projects (USD 50-250 million) with a medium level of environmental and social risk. Therefore, there is consistency between the SECAP with the environmental and social requirements of GCF.

The SECAP environmental and social management framework triggers a process equivalent to other multilateral organizations safeguard systems that carefully analyze programme, projects, loans and grants before implementation. An initial project screening that outlines the social, environmental and climate issues that are likely to be associated with an IFAD-supported project is done. The purpose is to identify the main social, environmental and climate risks associated with a potential project. Thus, the aim is to avoid activities that may cause harmful health impacts, involve any involuntary taking or restriction on the use of land resulting in physical or economic displacement. Furthermore the aim is to ensure that indigenous peoples and other traditional communities are involved and that the project does not damage or destroy physical resources of historic, religious or cultural significance. This assessment exercise allows IFAD to define the necessary steps for further analysis and propose relevant measures to minimize potential risks.

The exercise screens against the SECAP but also covers the IFC Performance Standards with an added view on climate risks providing an overarching framework for achieving improvements in environmental, social and climate related outcomes while addressing any unintended adverse impacts.

3. PROJECT COMPONENTS

3.1 COMPONENT 1. Climate-Resilient Productive Systems (CRPS)

The main objectives of Component 1 are to implement diversified agroforestry systems that will increase local water availability in the productive system and empower beneficiaries (especially women and youth leaders) in sustainable management of these systems. Investment strategies have been designed to meet the diverse demands of family farmers, given the range of sizes of land areas, climate-resilient adaptation requirements, target beneficiaries, and productive objectives.

Through the implementation of CRPS and relevant cross-cutting activities, the project will deliver **Output 1.1. Increase climate resilience for family farmers and traditional communities while mitigating carbon emissions by applying CRPS.**

3.1.1 Activity 1.1.1. Selection of Project Areas and development of Territorial Resilience Investment Plans (TRIPs)

Through Activity 1.1.1, the project will select its implementation area and develop Territorial Resilience Investment Plans (TRIPs) which will act as a “master plan” to guide collective and individual investments in components 1 and 2. As sole Executing Entity (EE), BNDES will have the final decision making power on project activities including: i) use of funds; ii) State selection and criteria for project implementation area; iii) criteria to select final beneficiaries; iv) criteria to define eligible practices and interventions; v) criteria for TRIPs approval; vi) requirements to procure TA teams and service providers. BNDES will verify the application of the criteria and requirements and will provide final approval

Sub-activity 1.1.1.1. Develop a baseline study to select project area

Step 1. Selection of states and PMEL. At a preliminary stage, the selection process will be based on state qualification, verification of borrowing capacity, poverty characteristics according to the PCRPs focus and targeting, climate vulnerability criteria, counterpart contribution capacity, implementation capacity (previous experience with IFAD or similar projects), social and economic indicators and implementation arrangements. The States taking part on the public call prepared by BNDES would be ranked through an in-depth analysis based on the following established criteria:

- (i) verification of borrowing capacity;
- (ii) state qualification;
- (iii) verification of counterpart capacity;
- (iv) incidence of rural poverty;
- (v) climate vulnerability index and historical exposure to drought;
- (vi) food and nutritional security index;
- (vii) water quality and availability;

After the application of the criteria, two to four NEB states will be pre-selected as eligible to present a Consultation Letter (Carta Consulta) to the Executing Entity (EE) – BNDES. This document will go through a deeper analysis by BNDES technical team before it is submitted for final approval by the BNDES’s Board of Directors. The process of selection of states, area and beneficiaries is included in more detail in the PIM (Annex 21).

Similarly, the institutions/organizations that participate in the competitive public call to implement activities of PMEL Unit, would be ranked through an analysis based mainly on the following criteria, and the pre-selected ones will present a consultation letter to the EE that will be thoroughly analysed by BNDES technical team and will be subject to the approval of BNDES Board of Directors:

- (i) client qualification;
- (ii) experience with the region and similar projects and themes;
- (iii) experience with similar budget;

Step 2. Define project area in each selected state. The municipalities within states will be ranked through an analysis based on the following criteria: (i) rural poverty incidence; (ii) climate vulnerability index and historical exposure to drought; (iii) food and nutritional security index; and (iv) water quality / availability. Technical Assistance (TA) will be selected per area, with one extensionist serving an average of four communities (total of about 140 families) over a three-year period for Component 1 activities and two-year period for Component 2 activities. This step will occur during the preparation of the State's proposal.

Step 3. Select beneficiary groups. In the beginning of the implementation phase at state level, each state will propose the beneficiary groups, focusing on those with the greatest climatic, socioeconomic and environmental vulnerability.⁶ A baseline survey will be conducted to collect information on agricultural production, herds, local climate, water availability, gender issues, nutrition, among others of the target population. Priority will be awarded to marginalized groups, youth, and women. Participation is not mandatory, so public awareness campaigns (see activity 3.1.1) and stakeholder engagement (Annex 7) are necessary. For indigenous peoples' communities, the project will also follow Indigenous People's Planning Framework (IPPF) plan as presented in Annex 6.

Sub-activity 1.1.1.2. Develop TRIPs. TRIPs are the planning tool for all activities proposed under Components 1 and 2. They include investments, resources, capacity building, and other initiatives to achieve the objectives. Each TRIP will cover an average of four territorially contiguous communities. To implement TRIPs, selected states will provide non-reimbursable funds (grants) to community organizations/associations. Final beneficiaries will only access such grants through community organizations/associations. The sub-grant agreements with community organizations and associations in Brazilian terms "acordos"; and IFAD has in-depth experience with its operations and accountability. Final beneficiaries will provide 10% in-kind contribution of the total TRIP and this will be captured in the "acordo". Technical assistance (TA) teams will be contracted by the States to design TRIPs with full involvement of beneficiaries based on the Manual for Designing Productive Investment and Business Plans. TA teams" are private service providers to be selected and procured by the states, following the guidelines of BNDES. Under component 1, four types of Investments in Systems of Agroforestry (ISAs) will be considered for: families (ISA Familia), backyard gardens (ISA Quintais), communities (ISA Coletivo), schools (ISA Escola) as well as a pilot on Bio saline agriculture. Once completed, the TRIPs will be submitted by the SIU for validation and evaluation of the state-level Consultative Council and then will be submitted for final approval by the states to BNDES. This mechanism will ensure greater involvement, participation and empowerment.

3.1.2 Activity 1.1.2. Implement CRPS in family farms and backyard gardens

Through activity 1.1.2, CRPS will be implemented in Family farms and in backyard gardens. Investments will receive TA for development, implementation, and initial monitoring.

Sub-activity 1.1.2.1. Implement CRPS in family farms

Objective: Reduce vulnerability of production to droughts and increase income, developing a progressive culture of multiple sustainable uses of productive areas.

Selection criteria: Target beneficiary families (sub-activity 1.1.1.1) that already have water for production.

Investments (ISA Familia): Resources to implement the CRPS.⁷

⁶ These selection criteria will be applied: (i) the environmental precariousness rate of its property (signs of deforestation, erosion, and soil degradation); (ii) food and nutritional insecurity rates (malnutrition and chronic degenerative diseases); and (iii) tangible effects of drought and level of access to quality water.

⁷ Seeds, seedlings, fertilizers, equipment rental or purchase, irrigation systems, tools, fences, etc.

Area: 31,000 plots with an average of 1/2 hectare each (total 15,500 hectares)

Sub-activity 1.1.2.2. Implement backyard gardens using CRPS

Objective: Develop irrigated, diverse and productive backyards in conjunction with activities in Component 2, applying CRPS principles to reduce families' food and nutrition insecurity from droughts, increase access to nutritious food as well as value and strengthen the role of women in production.

Selection criteria: Beneficiary group families (sub-activity 1.1.1.1) that don't have water for production. Same beneficiaries that will receive water access investments in Component 2.

Investments (ISA Quintais): Resources to implement CRPS.

Area: 36,000 gardens with an average size of about 1/5 hectare each (7,500 hectares expected)

3.1.3 Activity 1.1.3. Implement Collective Resilient Investments

The funds for collective investments are also non-reimbursable and will follow the same co-funding and TA as individual investment in Activity 1.1.2.

Sub-activity 1.1.3.1. Implement Collective Areas Sustainable Management (CASM)

With increasing population and land use in the Semiarid, there is a real threat that these communities could gradually deplete the Caatinga, mainly due to timber extraction for firewood and overgrazing.

Objective: The main objective is to improve the ecosystem services provided by the Caatinga, such as micro-climate regulation, carbon sequestration and fixation, pest and disease control, provision of water, decomposition of waste, natural pollination of crops and other plants, and provision of raw materials (timber, seeds, nuts, fruits, etc.). The system will stabilize and, if possible, increase the supply of forage. The enhanced ecosystem services help ensure that the community will be the main stakeholders in the conservation and recovery of the system in which they live in.

New options for income generation are needed, especially for women and youth, and the increase of forage for the herd, so that the animals gain more weight and compensate for possible loss of income due to the herd's reduction. It is possible to develop a slow and progressive culture of multiple and sustainable uses of the Caatinga and reduce extensive grazing, while increasing income, encouraging family succession, and conservation and recovery of the ecosystem services offered by the Caatinga.

Selection criteria: Communities that have a collective use area of around 500 hectares or more.

Undertakings:

- Recover degraded areas using CRPS;
- Decrease timber demand by implementing eco-efficient stoves and biodigesters;
- Increase supply and efficient use of water for production;
- Structure community seedbanks and nurseries;
- Promote low-impact productive activities in collective areas (e.g., beekeeping).
- Strengthening community governance of access and sustainable use of the areas.

Area: 60 CASM with an average size of 600 hectares each (total 36,000 hectares).

Investments (ISA Coletivo): Tools and materials for implementing CRPS, nurseries, eco-efficient stoves and biodigesters.

Sub-activity 1.1.3.2. Implement CRPS in Schools

Rural schools are where young people, children of farming families, acquire knowledge on various subjects, such as rural life and agricultural production. The project will seek to enable these educational institutions to work on CRPS, rational use of water for production, renewable energies, and other climate resilience practices.

Objective: Enable rural educational institutions for youth to experiment and teach CRPS, rational use of water for production, renewable energies, and other resilience practices to students. Target the cooks who prepare school meals, encouraging them to use native fruits and vegetables, reinforcing children's food and nutritional security.

Selection criteria: Rural schools within a range of the target areas (sub-activity 1.1.1.1). Preference will be awarded to Family Agriculture Schools (EFAs).

Undertakings:

- CRPS teaching and experimentation;
- Development and maintenance of nurseries and seedbanks;
- Promotion of entrepreneurship in CRPS; and
- Training for cooks and students on the nutritional value of native fruits and vegetables to diversify and enrich diets.

Area: 1,000 schools (100 families per school) with 1/10 hectare each (total 100,000 families and 100 hectares).

Investments (ISA Escola): Resources to implement the CRPS, such as seeds, seedlings, organic fertilizers, equipment rental or purchase, irrigation systems, tools, fences, nurseries, training materials, computers, etc.

Sub-activity 1.1.3.3. Test productive models of Bio saline agriculture

In the Semiarid, brackish or salty groundwater is common. Around 25% of wells have freshwater (< 500 mg/l TDS⁸), 33% are brackish (501–1,500 mg/l TDS), and 42% salty (>1,500 mg/l TDS).⁹ An estimated 75% of the wells in the Semiarid are unfit for human consumption. There are over 500 desalinization units operating in NEB, which produce residual water that currently accumulates in evaporation tanks with no productive use.

Objective: Develop pilot testing of productive activities using effluent from the desalination process.

Selection criteria: Communities benefitted from collective desalinization systems.

Undertakings: Fish breeding and irrigation of halophyte plants in small areas.¹⁰

Investment: Fish, tanks, irrigation equipment, resources to implement the CRPS, soil laboratory tests, etc.

Number of bio-saline production systems: 24 bio-saline system each irrigating 1 hectare and benefiting 50 families (total 1200 families and 24 hectares).

⁸ TDS – Total dissolved solids.

⁹ MME-CPRM-SERVIÇO-GEOLÓGICO-DO-BRASIL. **Projeto Cadastro da Infra-Estrutura Hídrica do Nordeste. Relatório Preliminar - 1ª Etapa - 225.000 km2 - Versão Beta**. Brasília: MME-CPRM-Serviço-Geológico-do-Brasil. Available at: https://www.cprm.gov.br/publique/media/hidrologia/m_apas_publicacoes/cadastramento_fontes_semiarido_brasileiro.pdf. 2003.

¹⁰ Hoffman and Shannon, 1985

3.1.4 Activity 1.1.4. Build a Farmers Network and Promote local entrepreneurship for products and services that support family farming

To facilitate the replication of CRPS, support will be provided: i) TA teams will build a territory-based intervention strategy identifying properties demonstrating exemplary experiences of CRPS and water access technologies and building a network to exchange these good practices; and ii) Small grants and business management support to microenterprises that innovate and produce specific tools and equipment to facilitate the implementation of CRPS.

Sub-activity 1.1.4.1. Build a Farmers Network; the following tools will be used:

Task 1.1.4.1.1. Train Farmers; TA teams will need to be trained in CRPS principles and practices, water access technologies and gender-transformational approaches (see Annex 8), appropriate for indigenous and traditional communities (Annex 6) and that attract youth.

In addition, farmers who already implement aspects of CRPS will be invited to be farmer-trainers. Their selection will not be limited by the criteria of target group or property size. They can have several roles in the project; from integrating TA teams, allowing visits to their farms as demonstration plots, or participating in local farmer network, trainings and workshops. The Project will ensure both women and men become farmer-trainers.

Task 1.1.4.1.2. Hold exchange visits; an important source of practical information and knowledge sharing. They involve organizing a group of farmers to visit another farmer or group. Although usually the visit is done to a 'more advanced' group, it is not a one-way process, because visitors discuss and comment what is being observed. These initiatives are often more effective than courses or lectures on the same topics due to language similarity and experience of real-life situations. Farmers from 5000 medium-sized farms (at least 5 hectares) located in the project's region will be invited to participate in the exchange visits. There will be an active participation of Young Communicators in these exchanges (sub-activity 3.1.1.1). Messaging apps are widely used in Brazil and can be applied to bridge communication gaps in farming communities. TA can create and manage online social-media tools to share experiences on specific topics and solve problems promptly. These tools can further the sharing of the knowledge learned in the exchange visits.

Sub-activity 1.1.4.2. Promote local entrepreneurship for products and services that support family farming

Most small-scale products and tools available to farmers are directed towards traditional large-scale monoculture, creating a vicious cycle that makes farmers turn to non-resilient production practices. Specialized small-scale equipment and mechanization can make farmers more productive and able to add value to their production.

The few scattered farmers who dare challenge the model must develop or adapt their own tools. During visits to Bahia and Pernambuco, the design team witnessed several examples of these innovations: forage palm chopper and feeder, long-arm pruning shears, wood chipper, and low-tech water reuse facility, among others. This thriving creativity and potential demand face high barriers to their widespread use. Microentrepreneurs in this sector are mostly small and lack the management capacity for commercial financing, making efforts to scale up or even start their businesses nearly impossible. Their innovations usually never go beyond their plot.

With greater access to capital – especially capital with management assistance and sustainability conditions tied to it – microentrepreneurs with businesses that have a direct impact on climate resilient agricultural production can scale up their operations and influence family farmers beyond the project's direct beneficiaries to improve their practices. A dynamic business environment can also attract youth.

The project will support investment in small-scale mechanization¹¹ of microenterprises that provide services or products for improving family farmers' CRPS thereby enhancing rural entrepreneurship. Small grants may support

¹¹ According to Brazilian Law, "microenterprise" is defined as a company with annual gross revenue of less than R\$ 360,000.

microenterprises that innovate and produce specific tools and equipment, nurseries, composting services, apps to manage production, organic fertilizers, pest control, and market platform, etc. These enterprises will also receive business management support. The GCF grant will cover the incremental costs associated with higher-than-average screening, evaluation and technical assistance costs of the fund's investments.

Expected results of **Component 1** include:

- 575 TRIPs designed and approved;
- 31,000 families benefiting from Family Farms Investments and TA;
- 36,000 families benefiting from backyard gardens investments and TA;
- 1,000 schools teaching CRPS;
- 1,800 families from 60 communities benefiting from CASM;
- 540 eco-efficient stoves installed;
- 540 biodigesters built;
- 540 income-generating and resilient production-based activities in collective areas;
- 1,200 families benefiting from 24 bio-saline productive systems;
- 5,000 medium-sized (at least 5-hectare) productive units participating in farmers networks;
- 550 TA and farmer trainers trained;
- 24,000 farmers participate in exchange events / workshops;
- 84,124 hectares under sustainable management;
- 11 MtCO_{2e} emissions reduced; and
- 70 micro enterprises supported to supply small-scale equipment for CRPS.

3.2 COMPONENT 2. Water access for production

The purpose of this component is to disseminate practices in efficient water capture, harvesting, storing and use to decrease vulnerability of livestock / crops to rainfall irregularity and prolonged droughts. All investments in this component will be financed as determined in the TRIPs for beneficiary groups (described in Activity 1.1.1.).

Component 2 beneficiaries are selected from a pool of families that will implement backyard gardens (described in Sub-activity 1.1.2.2) but do not have water for production. Irrigation in small plots allows diversified production, mainly with fruits and vegetables, for family consumption and to sell surpluses. The TA provided to the beneficiaries will focus on addressing issues of efficient water management, good irrigation practices, techniques for limiting evapotranspiration, and precautions to prevent soil salinization. All pumping systems will use renewable energy (photovoltaic or wind).

All water infrastructure methodologies selected in the PCRP are widely disseminated in NEB and are extremely simple to build, known in Brazil as “social technologies”. Construction of the water infrastructure technologies listed below is usually carried out by trained community masons, beneficiary families, and their neighbours with oversight from TA teams.¹² In addition to creating an activity for local workers, it also ensures future maintenance of the cisterns without relying on outside services. Technical training and training in water management will be systematically provided in association with the construction process. For further description of these technologies, see Feasibility Study in Annex 2.

Through the use of water technologies, the project will deliver **Output 2.1 Improve water access to family farmers and traditional communities to reduce the impact of severe droughts by investing in small-scale technologies for harvesting, reuse, treatment and storage.**

¹² The same technique has been used for construction of cisterns in the One Million Cisterns Program.

3.2.1 Activity 2.1.1. Build boardwalk cisterns for backyard gardens¹³

Investment: Materials to construct cisterns; irrigation equipment; tools and materials for implementing CRPS. Construction of a plate tank with storage capacity of 52 m³, coupled with a 200 m² concrete water-catchment area (boardwalk or *calçada*).

Application: Irrigate small plots to support short-cycle crops (mainly vegetables) during dry season. The role of women in this production is fundamental. Impact on family food security and nutrition are significant.

Total: 20,000 cisterns.

3.2.2 Activity 2.1.2. Implement social technologies to increase water in the field

Sub-activity 2.1.2.1. Build small farm ponds ¹⁴

Investment: Small-width deeply excavated reservoirs that store at least 500 m³ of rainwater to reduce evaporation and retain water for longer periods.

Application: Irrigate plots and support short-cycle crops during dry season.

Total: 500 farm ponds.

Sub-activity 2.1.2.2. Construct small groundwater storage basins

Investment: Construction of small underground dams through a transversal blocking system along temporary streams and river banks, with flexible plastic sheeting lining a trench (from surface to rock or impermeable layer).

Application: Capable of irrigating larger areas and storing a significant quantity of water for several months.

Area: 500 small underground dams.

3.2.3 Activity 2.1.3. Implement treatment and reuse systems for household wastewater

For rural families, untreated water represents risks to the environment, soil, and human health. Only 27% of the NEB population (mostly in urban areas) has access to sewage collection and treatment.¹⁵ The treatment systems selected use simple and affordable technology based on cycling water and nutrients for food production. These technologies adapt forms of rural sanitation to the household level and contribute significantly to sanitary improvement of environmental and living conditions of beneficiary families.

Sub-activity 2.1.3.1. Implement systems for grey water reuse

Investment: Construction of treatment system consists of filtering grey water residues through physical and biological mechanisms, in which organic matter is biodegraded by microorganisms and earthworms.

¹³ Cisterna Calçada - Instruction regulated by Law number 12.873, dated October 24, 2013. Decree number 8.038 of July 4, 2013 and Ordinance number 130 of November 14, 2013.

¹⁴ Instruction regulated by Law 12,873 of 24 October 2013, Decree number 8,038, of 4 July 2013 and Ordinance number 130, of 14 November 2013.

¹⁵ Instituto Trata Brasil, see: <http://www.tratabrasil.org.br/saneamento/principais-estatisticas/no-brasil/esgotoE>

Application: Irrigate small plots, such as backyard gardens and nurseries.

Area: 10,000 greywater treatment systems irrigating 1/5-hectare plots (2000 hectares).

Sub-activity 2.1.3.2. Implement green septic tanks

Investment: Construction of evapotranspiration tank (or green septic tank). Anaerobic digestion, which occurs in septic bed, consumes organic matter from household waste in the root zone of the plants.

Application: Can irrigate trees (usually banana trees, which are part of the treatment systems) and non-edible plants.

Area: 5,000 blackwater treatment systems irrigating 0.05-hectare plots (250 hectares).

Expected results of **Component 2 include**:

- 20,000 cisterns with walkway;
- 500 trench barriers;
- 500 small underground dams;
- 10,000 greywater reuse systems;
- 5,000 blackwater treatment systems.

3.3 Component 3. Knowledge management and scaling-up

Component 3 supports and expands on the activities in Components 1 and 2. The activities described below will be explored in the project so that information flows serve both to consolidate learning among families who will experience new approaches in CRPS and water access as well as to scale to a regional and international level the adaptation and mitigation measures that the project will propel. Strategies developed will drive upscaling and deliver **Output 3.1 CRPS and small-scale water harvesting system disseminated in the NEB semiarid and abroad to increase climate resilience of vulnerable communities.**

3.3.1 Activity 3.1.1. Raise awareness and build capacities of women, youth and traditional communities

This activity combines several strategies: i) highlight the leading role of youth and women as 'knowledge managers and generators' and 'local talents'; ii) consolidate laboratories for learning, exchange and replication of sustainable practices in communities through a set of printed and audiovisual materials; iii) facilitate dynamic M&E of socio-environmental impacts, which will be registered in materials that allow effective influence in spaces dedicated to public policy making.

Sub-activity 3.1.1.1. Develop a young communicators network

A total of 450 young people will be selected to participate in a media resource empowerment program focusing on successful experiences in accessing water resources and CRPS. In addition to being responsible for registering activities and facilitating production of audiovisual and printed materials, Young Communicators (YCs) will act as “social mobilizers”, fulfilling a crucial role in social organization processes.

Another important initiative in which YCs will take part, together with the farmers’ network (see activity 4.1), is the construction of a participatory monitoring model with audiovisual resources.

Local and regional exchanges between YCs will be promoted. YC will work closely with TA teams and community-based partner organizations. Each will receive a scholarship through a “learning grant” and have access to equipment (mobile phones and notebook computers).

Sub-activity 3.1.1.2. Strengthen capacity for women, youth, and traditional communities

All educational activities (workshops, courses, exchanges, etc.) will follow a “learn by doing” approach that explores experimentation of alternative technologies and information exchange among community members. Given that women, youth, and traditional communities tend to be on the margin of community-based organizing efforts, the project will prioritize capacity-building opportunities targeting these groups.

(i) **Rural women:** The project strengthens rural women's capacities as part of a comprehensive environmental education program that explores the connections between feminism, women’s rights, the Semiarid region biomes, agroecology, and food and nutritional security.

(ii) **Youth:** In addition to YC networks, youth will be involved in short-term professional courses with a focus on diversity of production systems and CRPS. The youth will then be incorporated in TA teams and serve as liaisons with families.

(iii) **Traditional communities:** Implementation of sensitivity trainings for TA professionals in issues of race and ethnicity, with a focus on methodological approaches and instruments that address the relationship these communities have with natural resources and land management techniques. The second line of action involves conducting case studies in traditional communities.

3.3.2 Activity 3.1.2. Drive scaling-up, unlock policy barriers and experiment with CRPS and resilience participatory monitoring model

Sub-activity 3.1.2.1. Promote south-south cooperation

Another aspect of this project involves developing capacities by sharing knowledge, skills, resources and technologies among countries through the construction of a more horizontal relationship of solidarity than the classic "North-South" cooperation. At the start of implementation, the exchange sites inside and outside Brazil and the prioritized systematization methods will be identified. IFAD is currently implementing the Dryland Adaptation Knowledge Initiative (DAKI,) which will pave the way for the project implementation, among other activities, will develop distance learning online platform in foreign languages and this tool could be used in case trips cannot materialize. At the start of implementation, the project will define the exchange sites inside and outside Brazil, the method of interaction (online or in person) and the systematization methods. In addition to TA team members, farmers will be invited to participate. The project will invest in construction of a database cataloguing the practices and technologies for proper management of natural resources that have been identified in these different contexts.

Sub-activity 3.1.2.2. Facilitate discussions to unlock policy barriers

The National Forest Code requires farmers in the Northeast to preserve 20% of their land as legal reserve. Family farmers, however, can perform certain productive activities in their legal reserves such as agroforestry and beekeeping. The Forest Code anticipates that States could implement a legal reserve quota (CRA) market, where farmers that preserve above their required 20% could sell their quotas. Several policies that are constraining family farmer's CRPS were identified during project design. The most notable include: i) lack of an Environmental Reserve Quota (CRA in Portuguese) market; and ii) norms and regulations preventing family farmers from accessing markets.

As recommended by the World Bank,¹⁶ establishing the CRA market could provide additional incentives for family farmers to increase the area covered by the climate-resilient agriculture principles laid out in the project. A CRA credit produced on a beneficiary's property could be used to offset a legal reserve (RL) debt on another property within the same biome, preferably in the same state. The RL debts represent obligations acquired by any given farmer that can be efficiently offset by environmental improvements produced by smallholder farmers with CRPS, thereby generating a transfer payment from the RL offender to the smallholders. Implementing a state CRA could create a market for forested lands, adding monetary value to a preserved Caatinga. Given the high costs of restoration/reforestation in the Caatinga and the climate-resilient agriculture principles laid out in the project, exchange of CRAs could become an effective way to facilitate Forest Code compliance, meeting NDC targets and preventing deforestation of surplus native vegetation.¹⁷

The Committee on World Food Security and FAO (2016) recommend that governments employ public policy to support family farmers with respect to issues such as pricing policies, public procurement, food safety and standards, and appropriate credit and infrastructure. Family farmers in Brazil are affected by top-down imposition of food safety standards designed to respond to large-scale mechanized and standardized food production for commodities and large distribution channels. As a consequence of these entry barriers, family farmers revert to informal markets with lower demand and prices.

The project will facilitate discussions in forums on marketing and market access for family agriculture. The proposal is to take advantage of existing organizational structures, reinforce them and create new ones. These working groups should involve a broad set of stakeholders (e.g., project beneficiaries, NGOs, private and public

¹⁶ The World Bank, June 2017. Brazil's INDC Restoration and Reforestation Target, Analysis of INDC Land-use Targets. Report No. AUS19554.

¹⁷ The project was designed assuming that the legal reserve markets will not be in place. Thus, there will be no impact of the project if the policy fails to be implemented.

sectors) and develop a roadmap to implement the CRA markets and improve regulatory conditions for family farmers' access to markets. It will also commission research on targeted policy and regulatory issues.

To qualify the inputs made in these forums on public policy, materials (publications and videos) will be produced that present results of the actions undertaken, in accordance with the progress indicators used in the M&E system. These publications – that present concrete social, environmental and economic results of transitioning to a model of family farmer CRPS – can influence public opinion, which in turn can contribute to the “scaling up” process.

Sub-activity 3.1.2.3. Experiment with CRPS and resilience participatory monitoring model

Since transition to CRPS is gradual and its social / economic / environmental impact not immediately perceived, a monitoring methodology is needed that demonstrates and gives visibility to transformations promoted during implementation. Systematization processes will be published and subsidize political advocacy processes, reaching external stakeholders, such as public managers and institutions working on related topics.

3.3.3 Activity 3.1.3. Plan, Monitor, Evaluate and Learn (PMEL)

A Planning, Monitoring Evaluation and Learning System (PMEL) will be developed as part of component 3 to allow the results-based project management. The data and information collected through the use of specific tools for the implementation of Climate Resilience Productive Systems (CRPS), will contribute not only to learning, feedback and improvement of project interventions but will also build the foundations for the material relevant to the knowledge management (KM). The PMEL will be a fundamental source of inputs to the Central Project Management Unit (CPMU/BNDES) decision making and will be in particular useful to provide feedback to the State level implementing unit(SIUs) at the state level. In order to manage the state level information, the Country-based Monitoring and Evaluation system (DATA-FIDA), developed and implemented for the ongoing IFAD Brazil portfolio will be used. The system has been developed by Programa Semear Internacinoal (PSI) and all projects in Brazil have been trained on its use. It is a project-supporting tool for organizing the information so that it reflects the implemented activities contribution both to the Logical Framework (LF) and to the projects AWPB. Each SIU will carry out the physical and financial monitoring of the implemented activities in its respective state using the DATA-FIDA system and will report to the CPMU to monitor the implementation of the project as a whole. During the first year of project implementation, improvements will be made to the DATA-FIDA system to allow the aggregation of the state data and handling by the CPMU, in addition, an interface will be implemented for DATA-FIDA to dialogue with the IT system of BNDES. The CPMU will be responsible for preparing and sending to IFAD the required consolidated progress reports and other project information, based on information provided by the SIUs. IFAD will be responsible for supervising project implementation, verifying results and recommending adjustive measures if targets are not being met.

PCRP aims to increase production while improving the most vulnerable peoples autonomous capacity to face the challenges posed by ongoing climate change. The target therefore is to increase and stabilize family income and food security while incentivizing young generations to stay active in rural activities even in areas/periods at risk of climate change impacts. As such project activities tackle the main barriers that limit an increased resilience of this specific population. Project performance indicators measure access to knowledge, technology and support required to overcome said barriers and increase their resilience in the face of ongoing climate change. The project applies in tandem a series of monitoring tools and strategies to ensure result-oriented monitoring and successful achievement of project objectives. Relevant results will be reported:

1. Avoided losses during drought events as compared to the 2010-2020 baseline;
2. Increase in soil moisture during the dry season;
3. Reduced and avoided emissions;
4. Increased resilience capacities; and
5. Behavioural change (i.e. Production practices, WASH, gender empowerment, minimum diet diversity)

The main MRE tools (further detailed in Annex 11) of the Program and Projects are: :

The **Logical Framework** integrates three levels of indicators: impact (based on results of Impact Assessment Studies), result and process (Project advances). The last two types are based on the results of actions in the field and support the rethinking and realigning of strategies and activities. The M&E system is sensitive to gender and generation; thus, whenever possible, these data will be disaggregated.

Baseline and Completion studies will be developed for an objective comparison of implementation progress and adequate measurement of projects impact and results related to the Project's expected outcomes. As minimum – together with project resilience scorecard and GIS mapping of Climate Change trends/impacts-, the following indicators will be included: i) income; ii) level of assets and equity; iii) production, consumption and commercialization; iv) natural resources and environmental management; v) level of families' participation in community-based organizations; vi) valuation of gender, race and ethnic identities; vii) access to public policies; and viii) food security. The baseline involves a sample survey of treatment groups (representing the beneficiary families) and a control group (representing those who will not be served by the project). Information will be disaggregated on gender for knowledge, attitudes and practices (KAP) regarding climate change adaptation in target communities. Research questionnaire will follow the model IFAD applies for its Projects in Brazil, adapted to cover other expected impacts as per proposal.

The project will **monitor changes in the resilience capacities of farming families** considering multiple factors, linked to socioeconomic and agroecological conditions, contributing to the families' capacities to cope with climate shocks and adapt to growing stress from slowly increasing temperatures and hotter and dryer conditions. Inspired by the DFID KPI4 Methodology adapted to the IFAD and GCF project type, a resilience scorecard and index have been developed tailored to the project's theory of change. The resilience questionnaire and scorecard may be adjusted by the PMEL in consultation with project stakeholders at project start-up and will be completed as part of the baseline survey, at midterm and at project completion. The resilience scorecard will be used for knowledge generation and improved analysis of resilience dynamics by combining it with the GIS-based monitoring studies of vegetation cover and ecological quality and climate data showing if stresses or extreme weather events have occurred during the implementation of the project.

M&E using Geographic Information System (GIS), including vegetation cover and ecological quality combined with monitoring of rainfall and temperatures, demonstrates vegetation recovery and is an input to calculate carbon sequestration. To analyse the restoration of recovered areas, the following ecological indicators will be monitored: canopy and soil cover, regenerating density, and number of regenerating species. This analysis extrapolates the limits of the intervention areas, evaluating the spillover effect of project actions. Vegetation recovery will be monitored every three years and studies should be preferably performed during/after the rain season. These studies will be implemented in partnerships with expert institutes or instruments, such as GEO-BNDES, the National Institute of Space Research (INPE), MapBiomass, in addition to specific consultancies.

A quantitative systematization of interventions by thematic area informs the Project M&E unit of the most immediate impacts on households in terms of resilience capacities, income and food security in short to medium term. These activities are articulated with other Project components and include specialists of different areas - Race, Ethnicity, Gender, and Youth. Results of learning exchanges will also be systematized and reported. At least 3 thematic systematizations will happen throughout the project execution period.

Participatory and qualitative evaluation of results. The CPMU through PMEL will hold participatory meetings and develop a monitoring methodology with the participation of youth communicators. M&E data will be used to communicate Project's results to the media, governments and partners. Outcomes of exchanges and learning initiatives will also be published as part of the Project Knowledge and Results Management.

Technical Progress Reports (TPR). State Projects will submit TPRs each semester with detailed descriptions activities by component and subcomponent. TPR informs to what extent implemented activities promoted progress in reaching the goals set in the Project design and Annual Operational Plan.

Expected results of **Component 3:**

- 54 workshops for young social communicators;
- 100 systematizing workshops;
- 9 state exchanges;
- 36 regional exchanges;
- 414 youth benefited with scholarships and communication equipment;
- 300 training workshops for women about sustainable technologies;
- 70 newsletters and informative reports produced;
- 360 territorial meeting for women;
- 12 exchange programs for women;
- 27 training workshops of gender experts;
- 243 training workshops for youth;
- 4 national learning routes;
- 3 international learning routes - LAC and Africa;
- 8 thematic studies.

Project Management

The project management governance is described in section B.4 and the PIM (Annex 21).

4. SOCIAL AND ENVIRONMENTAL BASELINE

4.1 Socio-economic context

The Brazilian semi-arid is located mostly in the Northeast region, occupying approximately 12% of the Brazilian territory and hosting 12% of the population, 11 million urban dwellers and 9 million rural dwellers in 1,262 municipalities, according to the official delimitation disclosed in 2017 (Sudene 2017). The Northeast is constituted of nine states: Bahia, Ceará, Pernambuco, Paraíba, Rio Grande do Norte, Piauí, Maranhão, Alagoas and Sergipe. Half of these states have more than 85% of their area characterized as semi-arid.

Rural poverty is deep, the semi-arid is Brazil's most impoverished region, hosting 3 million people living in extreme poverty, of which 46% belong to households in rural areas with the poor surviving through short-cycle types of subsistence farming, animal breeding in extensive systems, extractive activities (wood and non-timber products), temporary farm employment, and seasonal migration to urban areas. The semi-arid region is known for its severe socioeconomic problems related to long periods of drought and dry season. For almost four centuries the economic activities developed in the region were based on delayed production technologies in comparison to those in the most dynamic areas of the country, which helped to consolidate the image of the semi-arid region as a dry, poor, backward and futureless territory.

On the one hand, the impacts of extreme weather events are being felt with increasing intensity and are causing severe economic losses. Climate variability generates instability, which goes beyond the local perspective. The climate, historical relations of land tenure, political power and an increasing social protection network encourages migration to urban areas, not only exacerbating urban problems but also increasing the population of aging farmers in rural areas, which threatens the transition in the agricultural economy and the viability of family farms.

On the other hand, the semi-arid is a space of great concentration of land and water, and historically has always been in the hands of a small elite. This situation generates very high levels of social exclusion and environmental degradation and are determining factors of the socio-environmental crisis and economic situation in the region. Furthermore, the semi-arid has a history of political neglect and lack of public investment, especially in the rural areas. The distribution of resources across the regions of Brazil suggests regional differences in the abilities of smallholder farmers and institutions involved in accessing funds, in particular the PRONAF (National Program for the Strengthening of Family Agriculture). For instance, in the 2006-2007 agricultural year, 38% of this fund was destined to the southern region of Brazil despite only representing 19% of smallholder establishments. While the northeastern region, regardless of containing 50% of all smallholder farming establishments, only accessed 25% of PRONAF's resources¹⁸.

According to the 2006 Brazilian Agricultural Census, smallholder farmers are responsible for the production of most of the items in the consumer basket of Brazilian families, accounting respectively for 87%, 70% and 58% of the national production of cassava, beans and milk. Despite this, in Brazil, small farmers do not share the same amount of attention in government agendas, while industrial agriculture, which was focused on commodity production, received high financial incentives from the state. This circumstance was responsible for large economic and social impacts in the Brazilian rural environment, influencing the increase in rural exodus, poverty, food insecurity and interfering in population dynamics for decades.

The poorest people and communities in semi-arid are predominantly rural, and their livelihoods depend heavily on small-scale agriculture or family farming, a highly climate-sensitive sector. At the same time, people involved in family farming have limited access to financial and human resources, as well as manufacturing infrastructure, making its adaptive capacity smaller than that of corporate farming (with better access to funding and manufacturing infrastructure). Although Brazil is considered an upper middle-income country, disparities within

18 <https://ipcig.org/pub/IPCTechnicalPaper7.pdf>

the country at the State level reflects a stark figure of poverty and inequality. Table 1 presents the Municipal Human Development Index (MHDI); i.e. a local and more accurate measure to determine differences within counties.

Table 1. Socioeconomic rank of Brazilian States

Source: Atlas do Desenvolvimento Humano no Brasil (2010)

Rank	State	MHDI	MHDI Income	MHDI Life Expectancy	MHDI Education
1 °	Distrito Federal	0.824	0.863	0.873	0.742
2 °	São Paulo	0.783	0.789	0.845	0.719
3 °	Santa Catarina	0.774	0.773	0.860	0.697
4 °	Rio de Janeiro	0.761	0.782	0.835	0.675
5 °	Paraná	0.749	0.757	0.830	0.668
6 °	Rio Grande do Sul	0.746	0.769	0.840	0.642
7 °	Espírito Santo	0.740	0.743	0.835	0.653
8 °	Goiás	0.735	0.742	0.827	0.646
9 °	Minas Gerais	0.731	0.730	0.838	0.638
10 °	Mato Grosso do Sul	0.729	0.740	0.833	0.629
11 °	Mato Grosso	0.725	0.732	0.821	0.635
12 °	Amapá	0.708	0.694	0.813	0.629
13 °	Roraima	0.707	0.695	0.809	0.628
14 °	Tocantins	0.699	0.690	0.793	0.624
15 °	Rondônia	0.690	0.712	0.800	0.577
16 °	Rio Grande do Norte	0.684	0.678	0.792	0.597
17 °	Ceará	0.682	0.651	0.793	0.615
18 °	Amazonas	0.674	0.677	0.805	0.561
19 °	Pernambuco	0.673	0.673	0.789	0.574
20 °	Sergipe	0.665	0.672	0.781	0.560
21 °	Acre	0.663	0.671	0.777	0.559
22 °	Bahia	0.660	0.663	0.783	0.555
23 °	Paraíba	0.658	0.656	0.783	0.555
24 °	Piauí	0.646	0.635	0.777	0.547
24 °	Pará	0.646	0.646	0.789	0.528
26 °	Maranhão	0.639	0.612	0.757	0.562
27 °	Alagoas	0.631	0.641	0.755	0.520

Human Development Categories

Very High	0,800 - 1,000	High	0,700 - 0,799	Medium	0,600 - 0,699	Low	0,500 - 0,599	Very Low	0,000 - 0,499
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4.1.1 Family Farmers

Family farms account for almost all (generally over 90%)¹⁹ of agricultural properties in the semi-arid. These farms are usually smallholdings, with a significant proportion covering less than twenty hectares.²⁰ Despite some variants,²¹ they generally mix annual dryland agriculture harvesting food crops – mainly maize, beans and manioc – from shifting cultivations (known as *roçados*) for home consumption and sale, in addition to small-scale livestock-raising.

Whenever possible, families also have backyard gardens, a few fruit trees and poultry. Some of them, although only a few, also have small irrigated areas. The shifting food crop plots (*roçados*) cover part of these smallholdings, together with areas where fodder is grown (croplands and areas set aside for producing fodder, such as *palma do elefante*, for example).

In general, these properties also have wilderness areas left as *caatinga* scrublands, with at least part being second-growth *capoeira* scrubgrass.²² These scrubgrass areas may be included in shorter or longer rotation cycles with shifting food crop plots, resulting in a patchwork landscape that changes constantly, year after year. A constant source of forage, the *caatinga* scrublands are also used to harvest and produce non-timber forest products.

The vulnerabilities are a result of high poverty incidence, deforestation of the Caatinga Biome depleting the ecosystem services, inadequate productive practices which further degrade the soil, and water scarcity and poor quality. These conditions create a vicious cycle which is further aggravated by climate change stressors leading to desertification of the region. All these processes translate into losses of arable land, increased food insecurity and reduced local economic activities, lower farmers' income and rural exodus.

The last droughts have forced producers to find ways to produce more with fewer animals. Family farmers claim that, due to droughts, agriculture is no longer viable for many of them. Currently, they try to plant sorghum and corn (both crops that require high amounts of humidity) and wait for the rare rain to arrive to get something to feed the animals on the property. Honey production has become an important income for family farmers. This type of production is directly related to the conservation of forest resources, thus potentially playing a significant role in promoting the conservation of the semiarid's natural ecosystems. All produce is marketed locally through agroecological farmers markets ("ferias agroecologicas") or retail outlets. However, farmers claim that the Food Acquisition Program PAA and the National School Feeding Program (PNAE), the government food acquisition programs, created in 2003 and 2009 respectively, have not been enough and thus haven't provided a complete solution for them.

4.1.2 Youth

The population age distribution of the Northeast Region has changed, when comparing data from the 2000 to the 2010 Census it shows a reduction in the proportion of people up to 15 years old and a significantly increase in the proportion of people over 60 years of age. The proportion of young people²³ in the total population went from 33% to 26.5% in relative terms, at the same time as the proportion of people over 60 reached 10.3%, compared to 8.4% in 2000. The largest gap occurs for population ranging from 16 to 35 years of age. Whereas in 1991, no

19 A study of the São Francisco do Sertão Territory in Bahia State shows that 90.7% of the properties consist of family farms (ARTICULAÇÃO-NACIONAL-DE-AGROECOLOGIA, 2018). In the Chapada do Vale do Itaim Territory of the Sertão in Piauí State, this reaches 92.7 % (SIDERSKY, 2017).

20 Using data from the 2006 Farming and Ranching Census conducted by the Brazilian Institute for Geography and Statistics (IBGE), a study of the São Francisco do Sertão Territory in Bahia State showed that 62% of the farms and ranches in this Territory cover between 0 and 20 hectares.

21 Particularly in Piauí, Ceará and Rio Grande do Norte States, there are areas where cashew tree groves are often found on family farms, in addition to shifting food crop plots and livestock. There is a Territory in Bahia State where almost all family farms have areas set aside for perennial sisal plantations.

22 *Capoeira* scrubgrass areas may be included in longer or shorter rotations with shifting food crop plots.

23 Youth in Brazil includes people aged between 15 and 29 years, as per the Youth Law 12.852/2013.

northeast municipality presented rural population aging ²⁴ above 20%, in 2010 indices above 25% were found in the majority of rural municipalities in the Northeast region.²⁵

According to the Brazilian Institute of Geography and Statistics (IBGE) in relation to the total number of Brazilians living in the countryside, one in four are considered to be extremely poor, i.e. 25.5% or 4.1 million people, and 51% are young people (IBGE, 2010). Specifically in the North and Northeast regions, where indicators points out that 1.5 million rural young people experience situations of extreme poverty, which is equivalent to 34.88% of all young people living in the rural areas of Brazil. In a survey conducted by Unicef (2014), it was diagnosed that the majority of rural youths (45.5%) had not completed elementary school, 37.8% were in high school and 1.6% had reached university.²⁶

Youth lack of interest in agriculture is based on different reasons that go from the devaluation of the agricultural occupation, low income of family farmers, and the harsh labor conditions. Changes in rural population may be explained by youth exodus to urban areas in search for better opportunities and services. The few that have managed to remain in the region had been involved in family farming and later have gotten higher education and came back mainly as extension workers. Demonstrating that there are ways to regain an appreciation of family farming and offer relevant spaces for young people in rural areas.

4.1.3 Gender

The impacts of climate change are gendered, because of the strong relationship between poverty and vulnerability to environmental change, and the stark fact that women as a group are often poorer and have less access to resources (monetary and non monetary) than men (Nelson and others 2002). Research indicates that women and young girls living in rural areas of Brazil's Northeast, the project's target region, where women are deeply engaged in cultivating and collecting food, water, and fuelwood for their families, are the most vulnerable to climate change-related risks in the country (CEPAL 2016). The vulnerability of women to climate change impacts is linked to other social inequalities (race, ethnicity, class), their level of access to resources, and their capacity to cope with other problems associated with climate change such as health and migration (Adger 1999). They also face social, economic, and political barriers that hinder their capacity for adaptation, as they have limited access to effective and lasting policies and programs that address social and environmental adversities.

In rural areas, women are deeply involved in activities within the domestic sphere as well as in the spaces dedicated towards crop production, such as backyard gardens and cultivated fields or plantations. Approximately 46.7% of rural women are involved in subsistence agricultural activities in Brazil, compared to 14.0% of rural men (IBGE, 2009). The most common types of farming activities in which rural women are engaged include: bird breeding (73.5%); mixed crop / livestock production (72.3%); horticulture / floriculture (63.0%) (IBGE, 2009). Women's daily work is made invisible by the fact that most of their transactions and actions are not monetized or calculated, given that they are often not inserted in formal markets. Although women participate in work dynamics within the productive sphere, working in almost all tasks of the property, they are generally excluded from decision making about the use of financial and natural resources, jeopardizing their personal and financial autonomy (SILIPANDRI; CITRÃO, 2011).

Gender Assessment has shown on rural farms, mostly it is women who are deeply engaged in the agroecological transition. They introduce innovations in productive arrangements, generally being the first to suggest not using pesticides and chemically-based fertilizers, which in many cases leads to intra-family conflicts, usually due to the resistance of men (husbands and sons) to adapt to new models of agricultural production initially perceived as

24 Measures the ratio between the elderly aged 65 and over and the young population aged 17 years or less

25 MAIA, A. G.; BUAINAIN, A. M.; O novo mapa da população rural brasileira La nouvelle carte de la population rurale du Brésil. The new map of Brazil's rural population. Confins (Paris), Vol. 2015, Fac. 25, pp.1-26, Marseille, France, 2015.

26 Indígenas, negros e mulheres são mais afetados por pobreza. Unicef. Available at: <https://nacoesunidas.org/indigenas-negros-e-mulheres-sao-mais-afetados-por-pobreza-e-desemprego-no-brasil-diz-cepai/>

more time-consuming and less profitable. Women are often the first to coordinate productive processes following a logic of diversification, seeking ways to plant “a little bit of everything” in a variety of ways within different productive agricultural spaces, and seeking sustainable practices that do not harm the environment and make full use of local resources. They also have a greater awareness of the link between productive practices and consumption (food habits) and play a key role in food security within their families and communities, as they take greater responsibility for ensuring that all family members are well fed.

The PCRPP proposes a series of strategies for overcoming structural barriers to women’s participation in agriculture; providing capacities to undertake sustainable agricultural practices and subsequently increase their access to economic, social and natural resources. Within the PCRPP proposal, actions are proposed that aim to reinforce and validate women’s role in food security, biodiversity and environmental sustainability. As part of the proposal package IFAD has prepared a Gender Assessment annex that provides more details on gender issues and offers solutions for integrating a gender perspective in the thematic areas and strategies within the three components.

4.1.4 Traditional communities

Besides women and young people, indigenous peoples and the traditional communities are the groups subject to great socio-environmental vulnerability. In Brazil, and more specifically in the Northeast, these traditional communities are represented by the Quilombolas and the Fundo Pasto communities. The PCRPP recognizes the importance of the population of Quilombolas and Fundo Pasto in the northeast region as their presence is even bigger than the indigenous peoples and they also have official recognition from the government. The project not only ensures their involvement in the process but also prevents and mitigate any potential damage they may have during the course of the project implementation.

The Quilombola communities, descendent of African slaves, are officially recognized as traditional communities in Brazil Constitution and distributed throughout the national territory, where there are about 214 thousand Quilombola families, 63% of which are in the Northeast. According to data from the Ministry of Social Development - MDS, at least 58 thousand Quilombola families are located below the line of extreme poverty. (2016)

Quilombola communities suffer disproportionally from socio-economic disadvantages, the population has the worse morbidity profiles in relation to obesity and malnutrition in the country²⁷ Only 36,2% of Quilombola communities of the North Semiarid Region has running water, although the majority of municipalities in the region are reached by cisterns of the program Água para Todos²⁸. In the Semiarid region, Quilombola communities also are shown to have a very low rate of involvement in the formal school system: 87.3% of Quilombola heads of family have not completed primary education²⁹.

On the other hand, Fundo Pasto communities represent a modality of social organization based on the traditional system of collective land occupation, which is associated with extensive livestock via grazing the natural vegetation of the Caatinga. They are represented by thousands of families (estimated in more than 20,000) of farmers in Bahia, more precisely in the north-northeast and lower São Francisco regions, although it can also be found in other Northeastern states. From a total of 638 settlements in the State of Bahia, 23.8% are considered Pasto Grande communities. However, even though recognized by the national Law the Fundo Pasto community suffer from government programs that didn’t consider their traditional ways of organization, occupation of the territory and production systems. An example is the state government Programa Minha Roça which promoted the individual titling of the areas without considering the gregarious and communal perspective of the Fundo Pasto

27 Neves, Félix de Jesus. **Fatores Associados ao Déficit Estrutural em crianças quilombolas menores de 5 anos na região Nordeste do Brasil**. 2017. Available at: https://www.arca.fiocruz.br/bitstream/icict/24073/2/felix_jesus.pdf.

28 Pesquisa de Avaliação da Situação de Segurança Alimentar e Nutricional em Comunidades Quilombolas Tituladas (2014). Available at: http://www.mds.gov.br/webarquivos/publicacao/brasil_sem_miseria/cadernos_de_estudos20.pdf. p.41.

29 *Idem*.

community, so that there was a disarticulation of the dynamics of community associations and other forms of social organization.

One of the most striking features of Fundo de Pasto communities refers to institutional mechanisms for access and use of native lands and pastures created from discursive and customary combinations of rules of use and hospitality reinforced in situations of adversity and pressure exerted on the group, ruling principles of vital utility and shared socio-cultural organization³⁰.

These communities, most of which do not own property titles, suffer from the threats of grileiros (person who takes possession of land by means of false deeds) cattle ranchers and large agribusiness entrepreneurs, who try to enter the communal territories of the pasture funds and appropriate these areas. Also, it is very recent the recognition of these communities as "traditional", so that even the specificities in their forms of territorialization in the Semiarid are little understood by institutions of Technical Assistance and Land Regularization. Some specific conditions in these communities, such as the establishment of mutually supportive forms of mutual assistance are to be taken into account in the PCRPP

4.1.5 Indigenous peoples

The Northeast region is home of a total of 233,079 indigenous persons (26% of the total indigenous population), represented by 80 indigenous peoples' groups of which 51% are women and 49% are men. The state of Bahia hosts the majority of indigenous peoples of the Northeast (nearly 57,000 people), being the third state in Brazil in number of indigenous peoples, followed by Pernambuco (approximately 53,000 people)³¹.

Extreme poverty affects indigenous people six times more than the rest of the Brazilian population.³² According to UNICEF the main effects are poor health care, hunger, misery and malnutrition.³³ The mortality of indigenous children up to 5 years is nine times higher than the national average.³⁴ The precarious nutritional situation of indigenous children is clear from the fact that anemia affects 50% of them. In 2017, in the Northeast, the total number of deaths of indigenous children reached the number of 88³⁵.

The PCRPP will be implemented in the most drought affected semi-arid areas of up to three states of the Northeast Region of Brazil. The participation of the states will be determined based on specific criteria (e.g. borrowing capacity, expression of interest, capacity to meet the project's goal and capacity to implement the project in a timely manner, among others). At the present stage of design process it is still not possible to identify which indigenous peoples' groups and communities will be targeted. This will depend on the geographic coverage of Project's interventions that, at the same time, will depend upon states' participation.

Nevertheless, in line with the Green Climate Fund's Indigenous People Policy and with the IFAD Policy of Engagement with Indigenous Peoples, an Indigenous Peoples Planning Framework (IPPF) was prepared to ensure that indigenous peoples' rights are respected and that indigenous peoples' communities are able to actively participate and benefit from the development of project's interventions. With this objective, IFAD, together with

30 DIAMANTINO, P. T. "Desde o raiar da aurora o sertão tonteia": caminhos e descaminhos da trajetória sócio-jurídica das comunidades de Fundos de Pasto pelo reconhecimento de seus direitos territoriais. 2007. 143f. Dissertação (Mestrado em Direito) – Programa de Pós-Graduação em Direito da Faculdade de Direito da Universidade de Brasília, Brasília, DF, 2007.

31 Source: IBGE, Brazilian National Census, 2010 (census for 2020 not yet available)

32 Indígenas, negros e mulheres são mais afetados por pobreza. **Unicef**. Available at: <https://nacoesunidas.org/indigenas-negros-e-mulheres-sao-mais-afetados-por-pobreza-e-desemprego-no-brasil-diz-cepaf/>

33 Indígenas, negros e mulheres são mais afetados por pobreza. **Unicef**. Available at: <https://nacoesunidas.org/indigenas-negros-e-mulheres-sao-mais-afetados-por-pobreza-e-desemprego-no-brasil-diz-cepaf/>

34 Para a saúde da mulher e da criança indígenas sobram promessas e faltam soluções .Mobilização Nacional Indígena. Available at: <https://mobilizacao nacionalindigena.wordpress.com/2018/04/27/para-a-saude-da-mulher-e-da-crianca-indigenas-sobram-promessas-e-faltam-solucoes/>

35 Relatório da Violência contra os Povos Indígenas 2017. **CIMI**. Available at: https://cimi.org.br/wp-content/uploads/2018/09/Relatorio-violencia-contra-povos-indigenas_2017-Cimi.pdf. p.137

BNDES and participating states, will define a consultation process to solicit and obtain indigenous peoples' free, prior and informed consent (FPIC) before any action is taken in indigenous peoples' communities.

4.1.6 Nutrition

In recent decades, the Brazilian population has undergone major social transformations that have resulted in changes in their standards of health and food consumption. From 1996 to 2007, child stunting in the Northeast of Brazil has dropped from 22.2% to 5.9% (Demographic Health Survey, 2007). Pro-poor policy initiatives helped ensuring better income distribution and increased access to services, achieving significant impact on reducing poverty and social exclusion and consequently hunger and malnutrition, by addressing the main underlying causes of malnutrition: inadequate access to food, inadequate care for children and women, insufficient health services and an unhealthy environment. Furthermore, the improvement of maternal schooling and the increased purchasing power among the poorest Brazilian families directly contributed to the decline in the prevalence of childhood stunting³⁶.

Despite marked reductions in chronic malnutrition, improvements in the nutritional status of the population have not been homogeneous. With the highest rates of poverty in the Northeast region, traditional and indigenous peoples' communities are also more exposed to nutrition vulnerability. As recent research from the Ministry of Health has shown, stunting in children under five still affected 9,8% of indigenous children in the Northeast in 2017 (SIASI, 2017), wasting 2%, while 16% experienced overweight and obesity, being the Northeast the region with the highest number of overweight indigenous children in Brazil³⁷. At the same time, quilombola population has the worse morbidity profiles in relation to obesity and malnutrition in the country.³⁸ In general, there has been a steep increase in overweight in all segments of the population, pointing to a new set of problems related to food and nutrition (PNAN 2013)³⁹. The growing burden of obesity, and other nutrition related non-communicable diseases Brazilian population is experiencing today, is directly related with changes in eating patterns and lifestyles and increasing consumption of ultra-processed foods, which are often the more affordable in the market.

In the Northeast semi-arid region, there is a clear correlation between poverty rates, environmental constraints and food and nutrition insecurity. Severe and recurrent droughts and the scarcity of water are threatening food and nutrition security of family farmers already living in poverty. In this context, climate change is further exacerbating existing environmental problems (disruptions of water flows and poor quality of water sources, salinization of the soils, dissemination of pests and diseases) directly affecting the health status of rural population.

In this context, the PCRPP will maximize the contribution of its activities to improving nutrition, promoting the increasing and diversification of food production with attention to nutrition products, and their consumption at the household level. With the aim of increasing self-consumption of rural families and reduce the household's budget used for food purchases, PCRPP promotes the implementation of Climate Resilient Productive Systems (CRPS), incorporating the production of nutrient-rich foods. In indigenous and quilombola communities, attention will be given to promote dietary diversity by integrating neglected and underutilized species (NUS) with high nutritional value while selecting species for the CRPS. To ensure that diversification of agricultural production will translate into improved diets, the project will support beneficiaries in addressing gaps in nutrition knowledge. Fundamentals on nutrition and on food safety practices will be integrated in the technical assistance trainings delivered by the service providers. Training for cooks and students on the nutritional value of native plants to diversify and enrich diets will be also included in the schools where CRPS will be implemented. The adoption of social technologies

36 Monteiro, 2016. What Brazil can teach the world about tackling child malnutrition. <https://theconversation.com/what-brazil-can-teach-the-world-about-tackling-child-malnutrition-64652>

37 Mourão, 2018. Análise do estado nutricional de crianças indígenas menores de 5 anos no Brasil, 2016. Ministério da Saúde, Secretaria Especial de Saúde Indígena. <https://www.saude.gov.br/images/pdf/2018/novembro/16/Apresenta---o-Estado-nutricional-crian--as-ind--genas---Semin--rio-Sa-de-Ind--gena-em-Debate.pdf>

38 Neves, Félix de Jesus. Fatores Associados ao Déficit Estrutural em crianças quilombolas menores de 5 anos na região Nordeste do Brasil. 2017. Available at: https://www.arca.fiocruz.br/bitstream/iciict/24073/2/felix_jesus.pdf.

39 Source: http://189.28.128.100/dab/docs/portaldab/publicacoes/national_food_nutrition_policy.pdf

to improve water management and treatment for food production will directly contribute to increase food production and reduce risks related to unhealthy environment. Furthermore, particular attention will be given to increase women's empowerment and their decision-making, and decrease their burden of work, being women (and especially women heads of households) the main responsible for food production and preparation at the family level.

4.2 Natural Resources

The Caatinga is an exclusively Brazilian biome. It occurs in the sub-equatorial zone, between the Amazon Forest and the Atlantic Forest of the Brazilian Northeast. The Caatinga biome occupies an area mostly coincident with the Brazilian semiarid, which is described as the most biodiverse and the most populated semiarid region in the world (MMA, 2011). The word Caatinga originates from the Tupi indigenous language, meaning *mata branca*, or white forest.

The Caatinga occupies an area of about 844,453 km², equivalent to 11% of the national territory. It encompasses the states of Alagoas, Bahia, Ceará, Maranhão, Pernambuco, Paraíba, Rio Grande do Norte, Piauí, Sergipe and the north of Minas Gerais. The vegetation ranges from the deciduous low shrub to small patches of tall dry forests, often fragmented, with a height of up to 20 m (Prado, 2003). This region receives from 240 to 1500 mm annual rainfall, but mostly it receives less than 750 mm/year (Leal et al., 2005, Prado, 2003). The caatinga is the largest dry forest in South America. Rainfall in this region is extremely irregular, in both its temporal and geographical distribution; usually more than 75% of the total annual rainfall occurs within three months (Prado, 2003). The annual variations are large; droughts can last for years (Leal et al., 2005).

Some authors recognize two main types of Caatinga: dry caatinga ("sertão") located in the interior and more humid caatinga ("agreste") toward the coast.⁴⁰ However, others divide the Caatinga in up to eight categories⁴¹. The dry Caatinga biome preserves the nutrients better than the more water-rich, more dynamic (turnover) environments.⁴² Thus, most plant nutrients, despite their absolute depletion, show the highest values in Caatinga soils. This result may not be surprising when considering the more rapid element cycles under wet tropical conditions (Amazon Rainforest) as compared with the semi-dry condition of the Caatinga. The geology of the caatinga is in essence originated from very old Precambrian rocks, severely degraded during the Tertiary, and overlain by more recent marine sandstones and other sediments. There are remnants of crystalline outcrops, including monolithic mesas and isolated mountain ranges.⁴³

Historically, the periodic droughts, the erratic character of the rainfalls, soil limitations, and other environmental constraints did not allow the establishment of intensive agriculture, but stimulated grazing for animal production. Currently, about 19 percent of the cattle herd, 50 percent of the sheep herd, and 90 percent of the goat herds in Brazil are raised in what was once Caatinga. The grazing system is predominantly extensive, overgrazing is the dominant factor, fire is commonly used to prepare the soil for planting, and production indexes are the lowest in the country.

In the last two decades, desertification has advanced quickly, seriously threatening the Caatinga ecosystem. Main threats include the removal of vegetation for fuelwood and charcoal production for the residential, industrial, and agricultural sectors. Charcoal is used in the iron and steel industries, and fuelwood for households and gypsum

40 Lleras, Eduardo. "Caatinga of North-Eastern Brazil". Centres of Plant Diversity. 3: The Americas. Smithsonian Institute. Archived from the original on 3 March 2016

41 Eiten, G. (1983). Classificação da vegetação do Brasil. CNPq/Coordenação Editorial, Brasília

42 A soil geochemical background for northeastern Brazil Jörg Matschullat1*, Silke Höfle1, Juscimar da Silva2, Jaime Mello3, Germano Melo Jr.4, Alexander Pleßow1 & Clemens Reimann5

43 Ab'Sáber, A.N. (1977). Potencialidades paisagísticas brasileiras. Universidade de São Paulo, São Paulo.

kilns. Over-grazing and over-farming, soil erosion, and slash-and-burn by farmers and ranchers, are also major threats.

Deforestation and unsustainable irrigation practices have added to the salinization of the soils and increased the incidence of drought. Desertification has resulted in disruptions of water flows and poor quality of water sources, which in turn affects the health of human and animal populations. In addition, less than one percent of the Caatinga biome is protected, and of the few established conservation units, many are inoperative due to lack of consolidation.

4.2.1 Water resources.

The northeastern region has the lowest average annual rainfall in Brazil, less than 400 mm a year. Compared with other semi-arid regions of the world, where it rains between 80 and 250 mm per year, the Brazilian semi-arid is the rainiest on the planet and the most densely populated. As is natural for semi-arid regions, this volume of rainfall is lower than the evapotranspiration index, which in the Brazilian semi-arid region is 3,000 mm per year. This causes a water deficit that is extremely challenging for those who live on agriculture and animal husbandry in the region. A large part of the smallholding farmers in this region practice rainfed, that is, unirrigated agriculture.

Another important aspect in relation to the scarcity of water relates to the irregularity of the precipitations during the year. Rainfall, besides being low, is concentrated in certain months, even days. This irregularity brings serious problems for agriculture, livestock, humans and the environment.

In a region where the rivers virtually dry for several months a year, groundwater reserves as well as built reservoirs become of utmost importance. Groundwater is relatively abundant over about 50% of the Northeast region. However, the presence of crystalline soils in 70% of the northeast limits the supply of underground aquifers, while shallow soils present problems of water storage. Since the presence of water in the context of crystalline rocks of the semi-arid is naturally limited in time and space, its retention is achieved with reservoirs of varying sizes.

The hydrological efficiency of the reservoirs is estimated in 1/5 of the stored volume, due to the high evaporation rates. In addition, intense evaporation causes salination of the stored water. It is worth mentioning that the high losses by water evaporation and salination of the reservoirs are associated with little stimulation of appropriate planning and management of the reservoirs. When properly designed and operated, salinization and evaporation rates can be significantly reduced. For instance, the installation of flushing devices at the bottom of reservoirs can extract salinized water deposits at the end of the dry periods, which creates space for accumulation of fresh water during the next rainy season. The same operating scheme could transform a salinized well water into fresh water by pumping it at the end of the dry season.

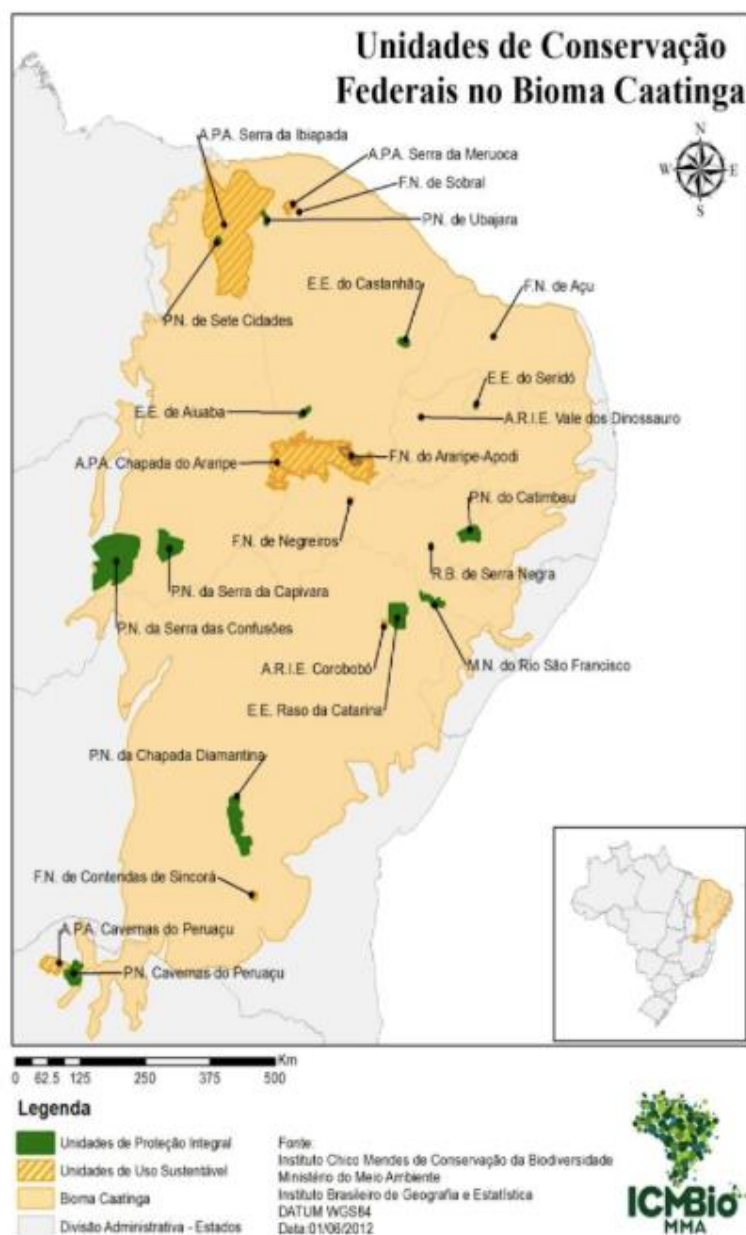
It is important to note that most existing wells do not have the expected characteristics of a geological engineering work, that is, constructed and operated within recommended technical standards. The lack of supervision and control needed at the federal, state and municipal levels undoubtedly has a great responsibility for the improvisation and empiricism, still very frequent, and lottery luck is attributed to the good result of a well.

4.2.2 Protected areas

According to the National System of Conservation Units (SNUC) framework, a protected area is a generic term that designates protected areas comprising both territorial spaces and environmental resources. The Caatinga is poorly represented in the Brazilian Conservation Area network, with only 1% in Integral Protected Areas and 6% in Sustainable Protected Areas. There are 25 federal protected areas in the Caatinga, 14 of Integral Protection and 11 Sustainable Use protected areas, which cover a little over 4% of the biome (as can be seen in Figure 1).

About 27 million people live in the region, most deprived and dependent on the biome's resources to survive. The states of Bahia and Ceará together encompass about 50 percent of the Caatinga (70 percent of Ceará's population and 50 percent of Bahia's population are within its boundaries). The caatinga biodiversity covers several economic activities geared towards agrosilvopastoral and industrial purposes.

The exploitation made by the local population since the occupation of the semi-arid region has led to a rapid environmental degradation. About 70% of the caatinga is already affected by human activities with 45% of its area deforested, the Caatinga is the third most degraded biome in the country, after the Atlantic Forest and the Cerrado. The Caatinga is a mosaic of thorn scrub and seasonally dry forests, with more than 2000 species of vascular plants, fishes, reptiles, amphibians, birds, and mammals. Endemism in these groups varies from 7% to 57%. However, only 7% of its area is protected in protected areas. Less than 1% of its area is in integral protection units (such as Parks, Biological Reserves and Ecological Stations), which are the most restrictive to human intervention.



Economic development has fragmented the native biome in the past. Estimates on the amount of Caatinga transformed affected by economic development range 25-50%, so the PCRPP will promote the protection of ecosystem services and productivity of farmers reducing the pressure over native forests.

As part of the development of the TRIPs eventual protected areas and their buffer zones will be mapped in detail, and the communities will be trained in protection and eventual sustainable use regulations and in co-management measures to ensure that all proposed intervention are in line with these. In case interventions are to be developed on areas which allow it, they must strictly follow the respective management plan or support development of one if lacking. TRIPs will include an updated ESMP to ensure monitoring and verification of compliance to respective management plans.

Figure 1. Map of Federal Protected Areas in the Caatinga

5. CLIMATE CHANGE

5.1 Context

The 27 million inhabitants of the Caatinga have profound problems with food production and food security, in large part because of droughts (there have been four in the last ten years). The 1977-79 drought resulted in widespread food scarcity, the death of an estimated 500,000 people (4 percent of the Brazilian population at the time), and the out-migration of three million others from the region. More recently, the drought of 1979-83 affected eighteen million people; almost 80 percent of crop yields were lost in some parts of the Northeast, and the Government spent approximately US\$1.8 billion in emergency programs.

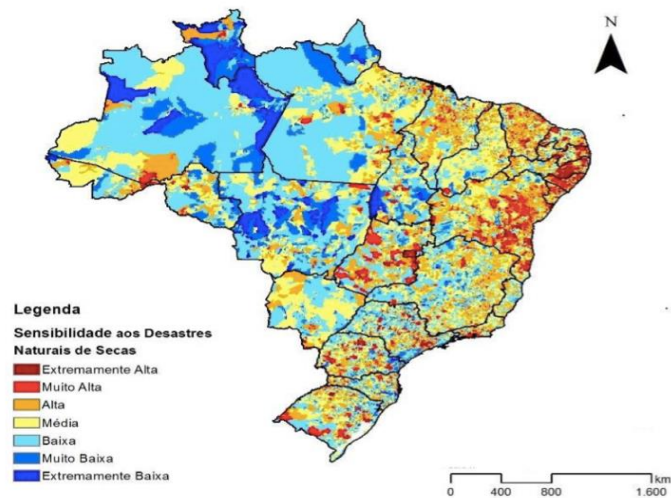


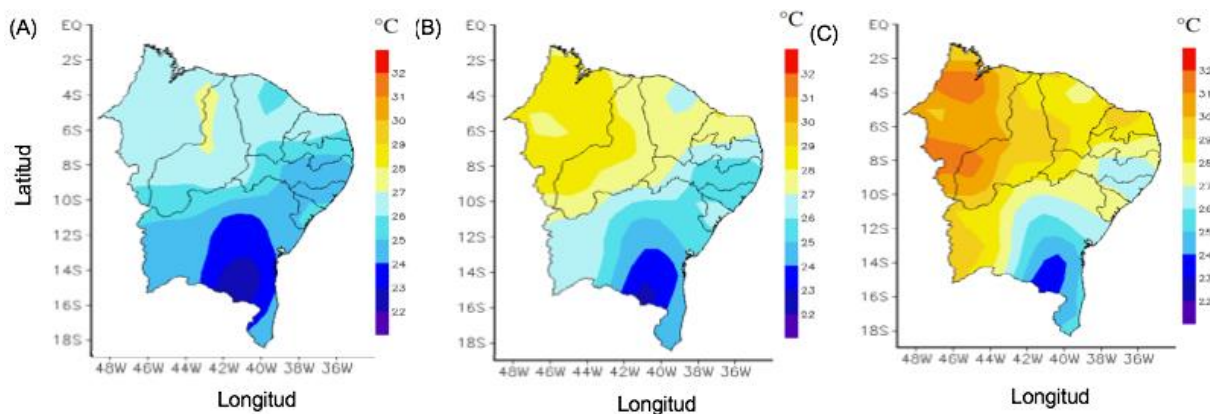
Figure 2. Sensibility to Drought Natural Disasters. (From top to bottom) Extremely High; Very High; High; Medium; Low; Very Low; Extremely Low (Source: MMA & WWF, 2017)

National and international surveys and climatic data from the Brazilian semi-arid region correlates with the happenings showing a gradual increase in average temperatures and a decrease in rainfall. Climate change affects the various areas of the semiarid with different intensity and frequency, but the regional trend shows an overall decrease in rainfall and rising temperatures as shown in Figure 1.

Moreover, spatial distribution of the annual average temperature in the Northeast region of Brazil as presented in the figure 3 also associates the severe droughts with results obtained in the COSOP 2016 document "Climate Change and Impacts on Family Farming in North and Northeast of Brazil".

Where (A) is the average annual temperature for the period 1961-2007. (B) the scenario annual average temperature for the year 2050. And (C) the scenario annual average temperature for the year 2100.

Figure 3. Droughts results 1961 - 2007



The northeast region of Brazil⁴⁴ composed primarily of the states of Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, and Bahia is semi-arid with average average minimum and maximum temperatures between 21.23°C and 30.85 °C respectively; it is qualified as a tropical dry climate. This region can get much hotter during the dry season, has a short, erratic rainy season from March to May, and annual rainfall averages of 390 to 1,550 mm. The coolest months on average are June and July and the warmest is October. Lowest minimum temperatures can be found in the central area of the State of Bahia, while maximums concentrate primarily in the most northern states.

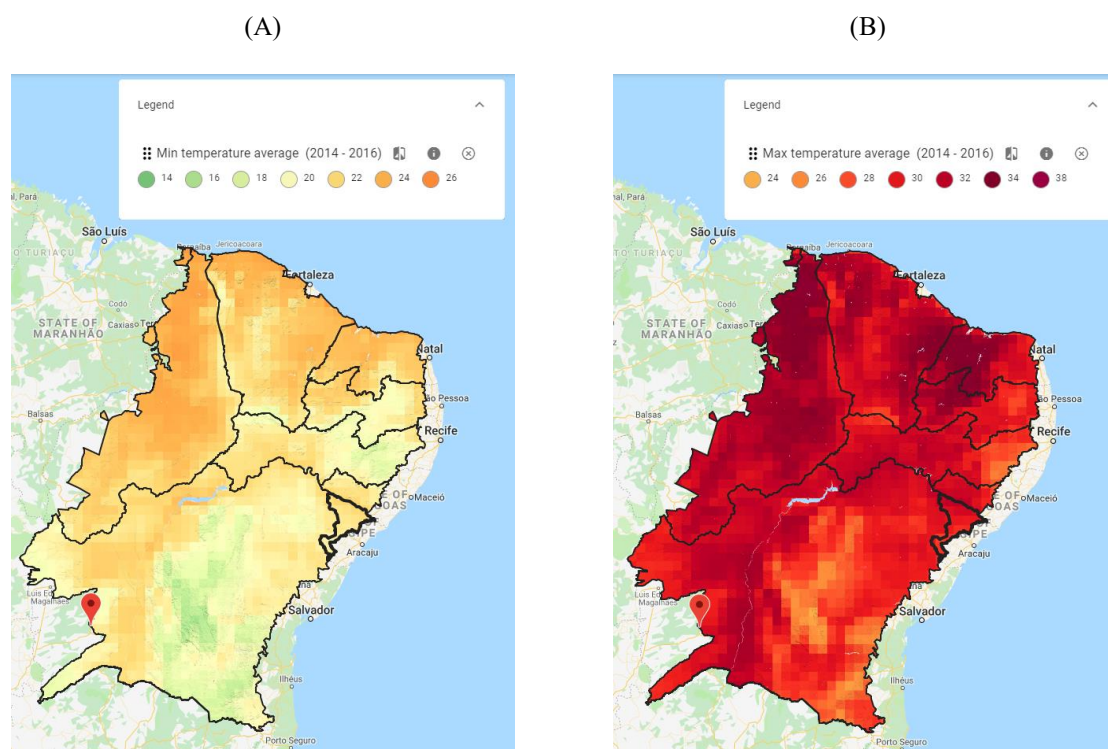


Figure 2 Min (a) and Max (B) average temperature 2014-2016

For Semi-arid NEB between 1989 and 2016, minimum average temperature has increased by 0.76°C; while maximum average temperature has increased by 1.25°C. During that period the Semi-arid portion of Bahia's max temperature increased by 1.58°C up to 29.9°C; of Piauí by 2.05°C up to 32.3°C; of Ceará by 0.88°C up to 31.78°C; of Rio Grande do Norte by 0.51°C up to 32.02°C; of Paraíba by 0.45°C up to 30.72°C; of Pernambuco by 0.68°C up to 30.44°C; of Alagoas by 0.70°C up to 29.63°C; and of Sergipe by 0.96°C up to 29.32°C.⁴⁵

44 The Resolution 115 of 23/11/17 from Sudene defines the Semi-arid by the following characteristics: i) Average annual rainfall of 800 mm or less; ii) Thornthwaite Aridity Index equal to or less than 0.50; and iii) Daily percentage of water deficit equal to or greater than 60%, considering all days of the year.

45 Important variations may occur at district level; information has been developed up to ADM2 and is presented in FAO EarthMap platform for all available data sets.

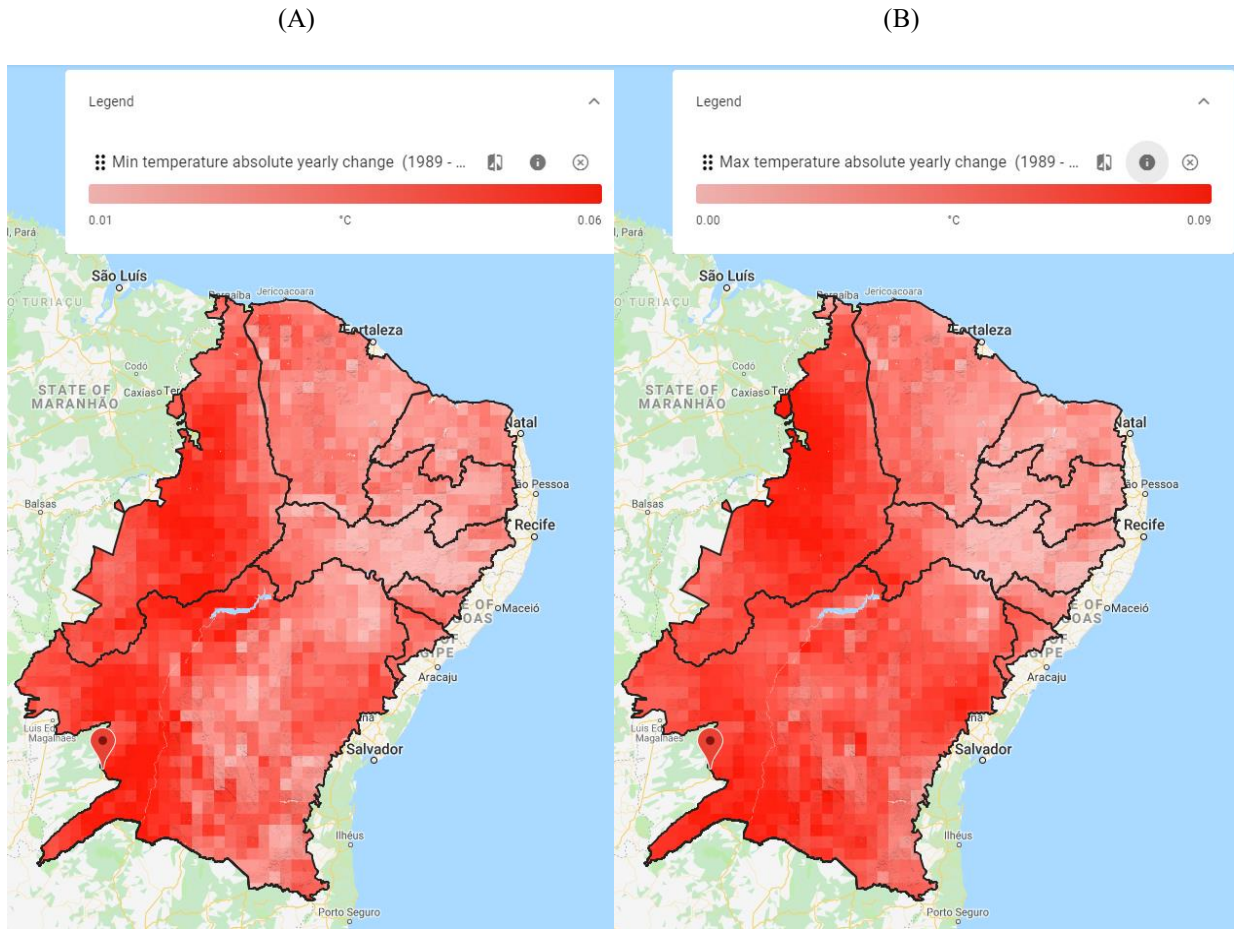


Figure 3 Min (A) and Max (B) temperature absolute yearly change 1989 – 2016⁴⁶

Average annual rainfall for the entire project area is about 645 mm, the Semi-arid NEB presents great variability in rainfall distribution with average rainfall variations ranging from 390 mm in districts like Retirolandia, Valente, and Gaviao to 1,550 mm in districts like Barras, Batalha, Mucambo and Graca (Figure 4 (A)). Generally, the driest period is from June to September, with August and September presenting the lowest average rainfall. Average Annual precipitation has reduced by approximately 74 mm between 1981 and 2018. During that period the Semi-arid portion of Bahia's average annual rainfall decreased by 91.70 mm to 548.47 mm; of Piauí by 66.30 mm to 760.22 mm; of Ceará by 85.90 mm to 735.41 mm; of Rio Grande do Norte by 46.14 mm to 671.25 mm; of Paraíba by 4.69 mm to 693.02 mm; of Pernambuco by 57.55 mm to 570.30 mm; of Alagoas by 60.98 mm to 673.36 mm; and of Sergipe by 120.01 mm to 734.49 mm.

⁴⁶ European Centre For Medium-Range Weather Forecasts (ECMWF), 2016.

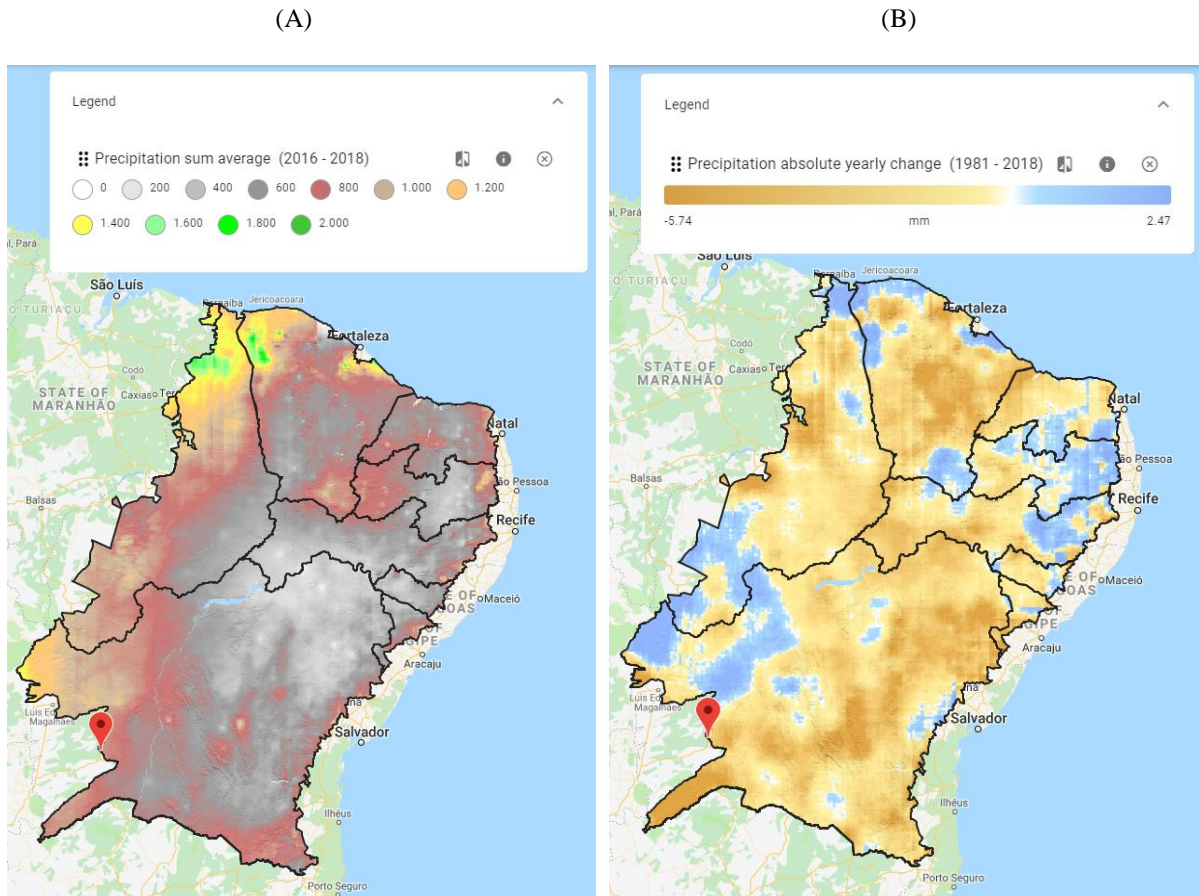


Figure 4 (A) Precipitation sum average 2016 - 2018⁴⁷; (B) Precipitation absolute yearly change (1981-2018)⁴⁸

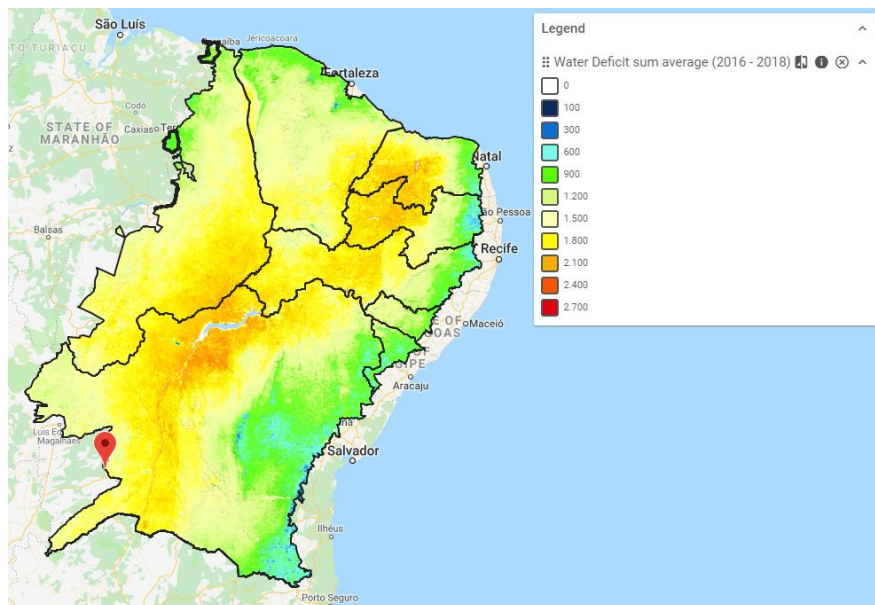


Figure 5 Climatic water deficit sum average 2016 – 2018⁴⁹

47 CHIRPS: Climate Hazards Group InfraRed Precipitation with Station data (version 2.0 final)

48 Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS v2)

49 LP DAAC derived from processing MOD16A2 MODIS/Terra Net Evapotranspiration 8-Day L4 Global (500m), version 6

The region is highly affected by climatic water deficit (figure 5) deriving from high annual evaporation. Average Climatic water deficit has grown from 2001 to date by 65.62 kg/m² with important peaks in 2012 and 2015 reaching a deficit of up to 1 709.33 kg/m². The areas most affected are low lying inland terrains highly vulnerable to droughts. Within Semi-arid NEB, water bodies represent less than 1% of total land cover; while the highest percentage of territory is shrubs at approximately 36%; another 19% are dry forests, 17% is grassland. Bahia and Piauí, are the states with highest concentration of areas suffering from annual fires, as well the areas with most access forest resources.⁵⁰

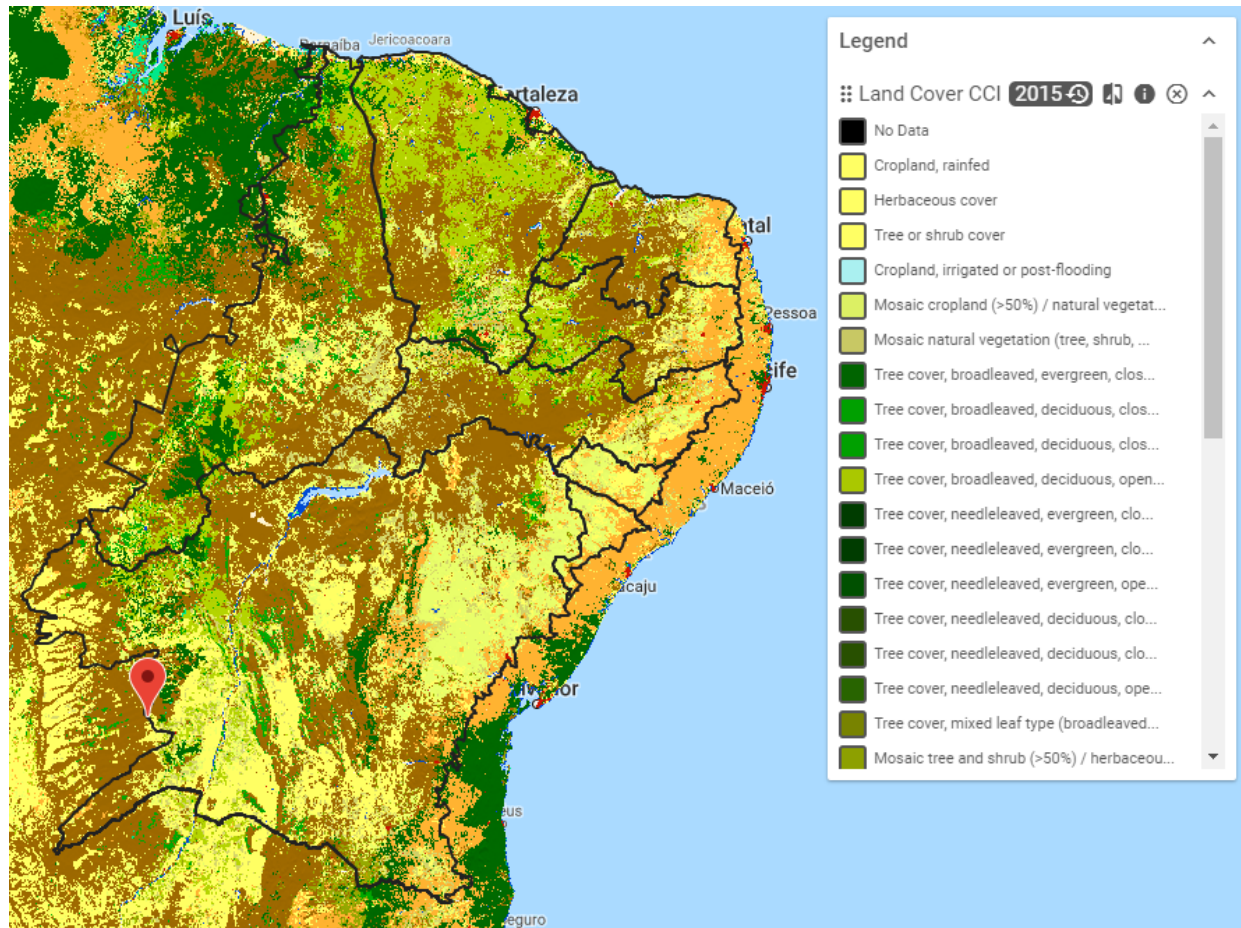


Figure 6 Land Cover ⁵¹

50 MCD64A1.006 MODIS Burned Area Monthly Global 500m

51 ESA Land Cover CCI (300 m spatial resolution)

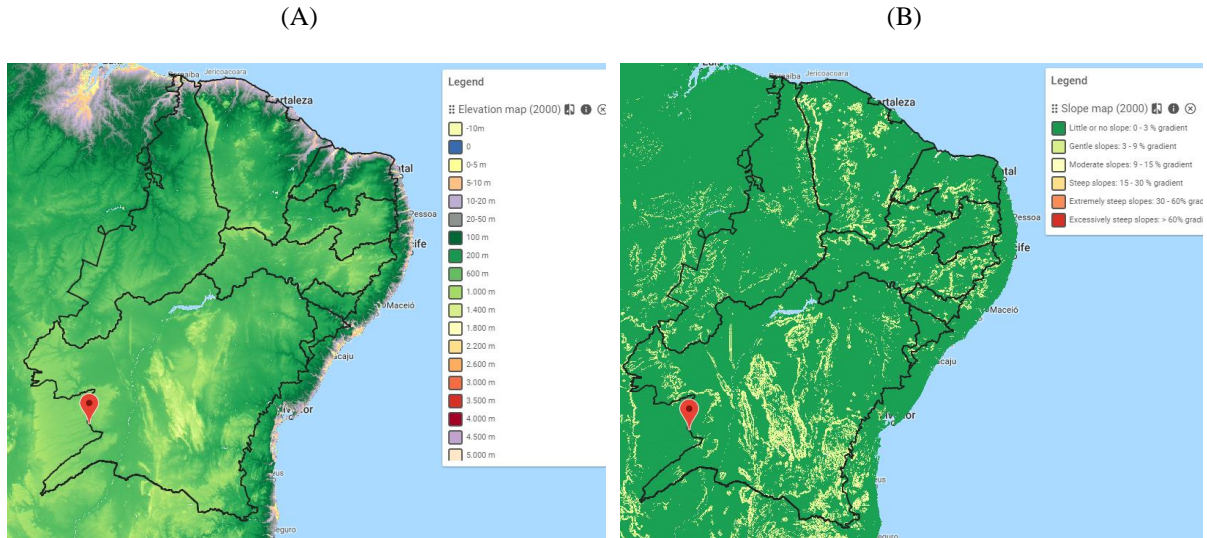


Figure 7 (A) Elevation Map of NEB⁵², and (B) Slope

Figure 8 presents anomalies regarding minimum and maximum temperatures, and precipitation. These are calculated by comparing average records between the period 2013 – 2017 against the period 1989 – 2017, and presented in deviation by pixel for each select data set. Important variations in temperature and precipitation were perceived and coincide with statistics on the 2011-2016 drought having areas of Semiarid NEB with monthly maximum temperature deviations of up to 2.47°C and monthly precipitation deviations ranging from approximately -90.28 mm to 117.00 mm.

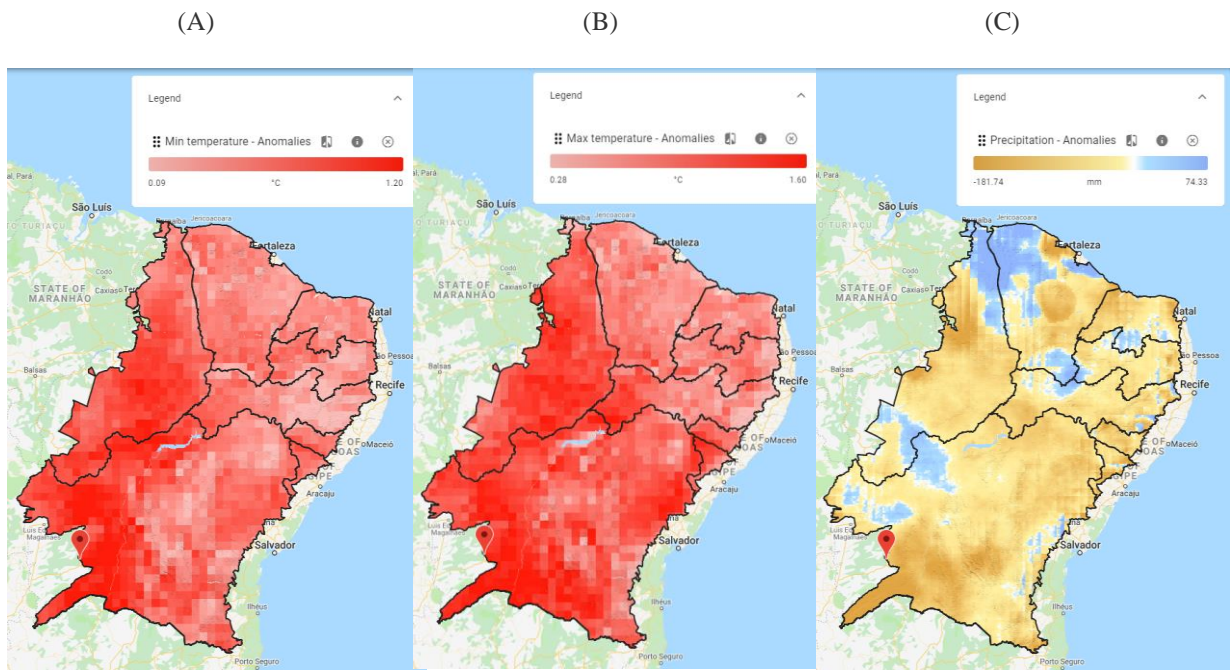


Figure 8 (A) Min and (B) Max⁵³ temperature anomalies; (C) Precipitation anomalies⁵⁴

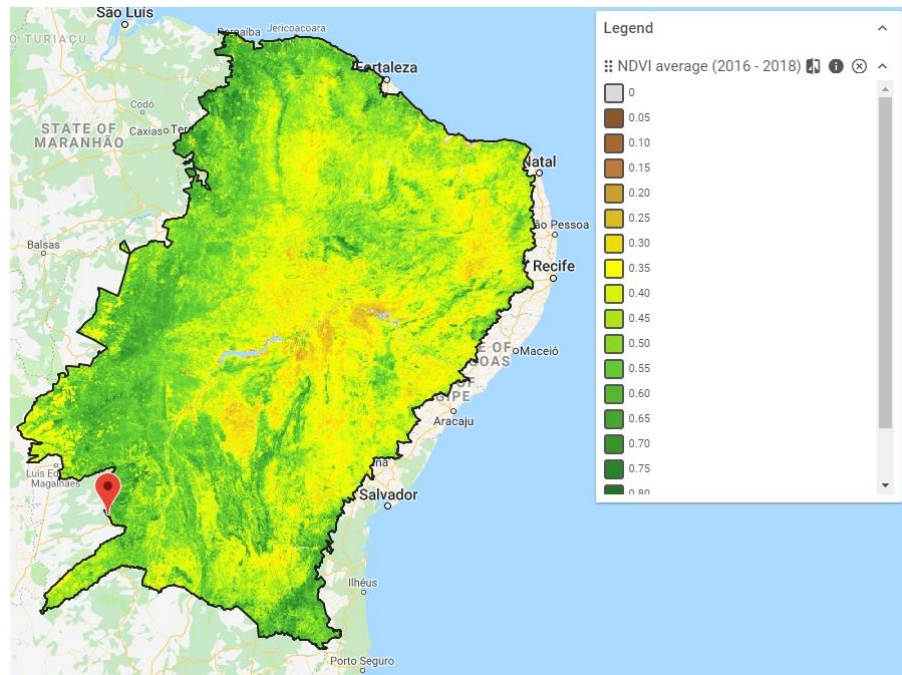
⁵² SRTM Digital Elevation Data Version 4

⁵³ ECMWF Dekadal Minimum and Maximum Temperature

⁵⁴ CHIRPS pentad: Climate Hazards Group InfraRed Precipitation with Station data (version 2.0 final)

Normalized Difference Vegetation Index (NDVI) provides an alternative measure of vegetation amount and condition. Figure 7 presents the average NDVI for the period 2016-2018 (A) and the absolute yearly change between the period 2001-2018 (B). As can be seen, most portions of the Semi-arid NEB have suffered consistent reductions in NDVI for the analyzed period. Notwithstanding the negative trend and high risk of tree loss (figure 10) under a BaU RCP 8.5 scenario; the region also has an important capacity to support restoration of tree cover under adequate management policies and practices.

(A)



(B)

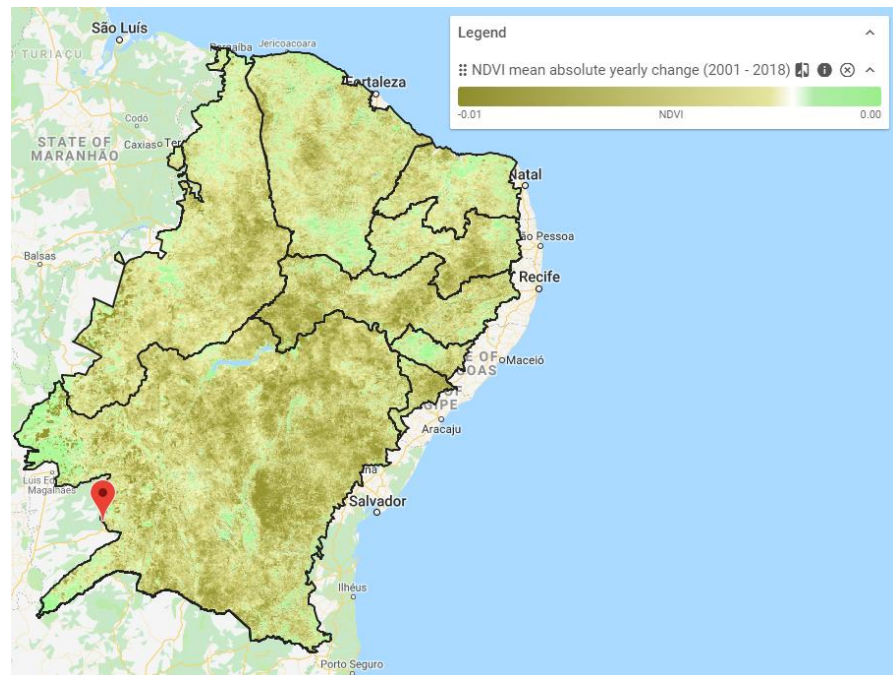


Figure 9 (A) NDVI Average 2016 - 2018; (B) NDVI mean absolute yearly change⁵⁵

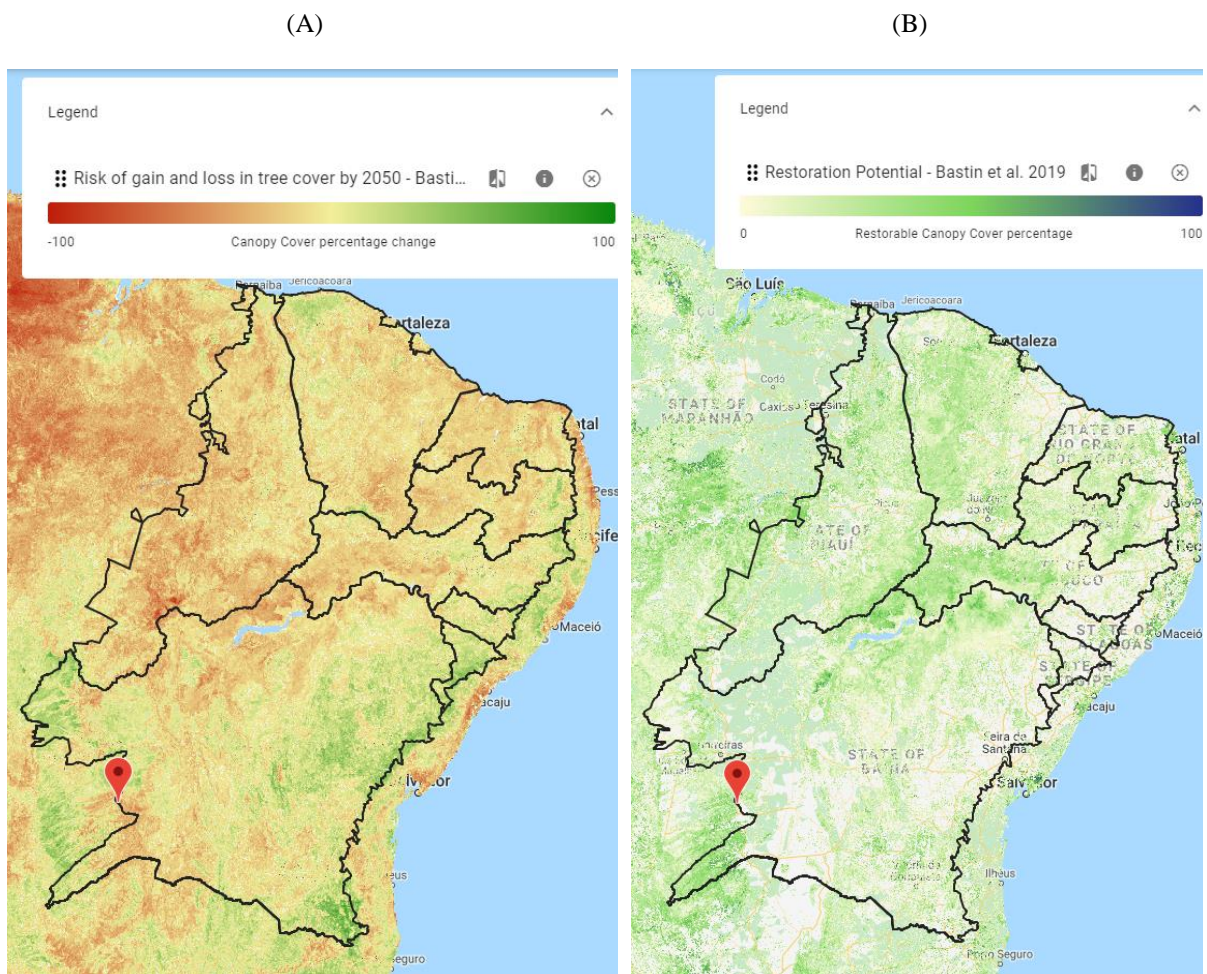


Figure 10 (A) Risk of gain and loss in tree cover under a “BaU” scenario RCP 8.5; and (B) restoration potential⁵⁶

⁵⁵ LP DAAC derived from processing MOD13A1 Vegetation Indices 16-Day L3 Global

⁵⁶ The global tree restoration potential (Bastin et al. 2019)

5.2 Climate change scenarios and impacts

The project will take place in the Semi-arid region of Northeast Brazil (NEB),⁵⁷ a region hosting 27 million people⁵⁸. The rural semi-arid of the nine northeastern States are where IFAD has been supporting rural development for the past 25 years. The northeast region has experienced secular chronic problems related to water scarcity, with periodic droughts. Nonetheless, the drought that affected this region during 2011-2016 is considered the worst in the past 100 years and has exacerbated many social problems through the indebtedness of farmers, migration, disease, and malnutrition.^{59, 60} The estimated economic losses of this drought event are in the order of US\$ 6 billion in the agricultural sector alone.⁶¹ "Climate change and variability are among the main threats to socio-ecological sustainability in many semi-arid regions. High levels of social vulnerability in the northeast of Brazil make this region one of the most susceptible to the impacts of climate change in the country."⁶² It is possible to identify an increase in temperature from 1901 to 2000 of about 0.8 °C in NEB, and an important acceleration in warming during the last three decades. An analysis on drought events that occurred in the Semi-arid from 1981 to 2016⁶³ reveals that drought intensity for the last 36 years has been increasing, and that recent droughts were more frequent, more severe and affected a larger area with significant impacts for population, as well as economical activities. The northeast region has experienced secular chronic problems related to water scarcity, with periodic droughts. Nonetheless, the drought that affected this region during 2011-2016 is considered the worst in the past 100 years and has exacerbated many social problems through the indebtedness of farmers, migration, disease, and malnutrition.^{64, 65} The estimated economic losses of this drought event are in the order of US\$ 6 billion in the agricultural sector alone.⁶⁶

The Brazilian National Institute for Space Research (INPE) has been providing the government with regional climate scenarios by downscaling global climate models. Four sets of downscaling simulations based on the Eta Regional Climate Model forced by two global climate models, the HadGEM2-ES and the MIROC5, and two RCP scenarios—8.5 and 4.5, have been carried out⁶⁷.

Projections point to the warming of the entire continent. For the Northeast region, accordingly, the simulations (HadGEM2-ES and MIROC5 for two RCP scenarios—8.5 and 4.5) predicted a temperature increase from 0.5 – 2.0°C in the period 2011- 2040 compared to a baseline period of 1961-1990⁶⁸. It is expected that the interior – which is already becoming drier – would be more affected than the coastal areas.⁶⁹ Despite the rise of precipitation in the summer, the projected annual cycle shows a dominating annual **reduction of rainfall in the region**.

57 The Resolution 115 of 23/11/17 from Sudene defines the Semi-arid by the following characteristics: i) Average annual rainfall of 800 mm or less; ii) Thornthwaite Aridity Index equal to or less than 0.50; and iii) Daily percentage of water deficit equal to or greater than 60%, considering all days of the year.

58 Ministry of Integration webpage, available at: <http://www.integracao.gov.br/semiarido-brasileiro>

59 Gutiérrez APA, Engle NL, De Nys E, Molejon C, Martins ES (2014) Drought preparedness in Brazil. *Weather Clim Extremes* 3:95– 106. doi:10.1016/j.wace.2013.12.001

60 Marengo, Jose A., et al. "Climatic characteristics of the 2010-2016 drought in the semi-arid Northeast Brazil region." *Anais da Academia Brasileira de Ciências* 90.2 (2018): 1973-1985.

61 Marengo, Jose A., Roger Rodrigues Torres, and Lincoln Muniz Alves. "Drought in Northeast Brazil—past, present, and future." *Theoretical and Applied Climatology* 129.3-4 (2017): 1189-1200.

62 Patricia S. Mesquita & Marcel Bursztyn & Hannah Wittman, 2014. "Climate Variability in Semi-arid Brazil: Food Insecurity, Agricultural Production and Adjustment to Perceived Changes"

63 Brito, SSB; et.al. Frequency, duration and severity of drought in the Semi-arid Northeast Brazil region, *International Journal of Climatology*, 2017.

64 Gutiérrez APA, Engle NL, De Nys E, Molejon C, Martins ES (2014) Drought preparedness in Brazil. *Weather Clim Extremes* 3:95– 106. doi:10.1016/j.wace.2013.12.001

65 Marengo, Jose A., et al. "Climatic characteristics of the 2010-2016 drought in the semi-arid Northeast Brazil region." *Anais da Academia Brasileira de Ciências* 90.2 (2018): 1973-1985.

66 Marengo, Jose A., Roger Rodrigues Torres, and Lincoln Muniz Alves. "Drought in Northeast Brazil—past, present, and future." *Theoretical and Applied Climatology* 129.3-4 (2017): 1189-1200.

67 CHOU, S.C.; et.al. Assessment of Climate Change over South America under RCP 4.5 and 8.5 Downscaling Scenarios. **American Journal of Climate Change**, v. 03, p. 512-527, 2014.

68 Chou, SC; et.al. Assessment of Climate Change over South America under RCP 4.5 and 8.5 Downscaling Scenarios. *American Journal of Climate Change*, v. 03, p. 512-527, 2014.

69 International Policy Centre for Inclusive Growth (IPC-IG) Working Paper No.141; UNDP, 2016. "Climate change and impacts on family farming in the North and Northeast of Brazil"

Furthermore, an **increase in the length of consecutive dry days** and wide climate variability are common features in these and other simulations for the NEB⁷⁰. Dry summer months are expected to perceive a moderate increase between 2 and 6 °C in NEB⁷¹. Impacts are expected to grow exponentially within a range temperature increase of approximately 4.5 °C for the period 2041 and 2070, in line with IPCC projections.

A more specific study in the Northeast confirmed the findings of the South American downscaling scenarios discussed above. Both station data analysis and numerical simulations (for the periods of 1960-2000 and 2010-2050) revealed **trends of increasing maximum temperature and diminishing precipitation**. The water-balance calculations showed reduced soil moisture availability and total rainfall. The atmospheric model simulations were consistent with the station data regarding the present warming; the climate change scenarios for 2010-2050 indicated a faster increase of daily maximum temperature over the Northeast compared to that simulated for the recent past.⁷²

An analysis on drought events that occurred in the Semiarid region of Northeast Brazil from 1981 to 2016⁷³ reveals that drought intensity for the last 36 years has been increasing and that **recent droughts were more frequent, more severe and affected a more substantial area** with significant impacts for population, as well as economic activities. Drought intensity was measured by three indicators: duration, which equals the number of months of the event; frequency, the number of events per period; and severity, which measures the absolute negative value of the hydro-meteorological and agricultural indexes used.

When modelling surface and groundwater supplies per water basin, the results for the Northeast region are alarming, **estimating a sudden reduction in flows by 2100** in the river basins that supply the region: *São Francisco, Atlântico Norte e Nordeste* and *Atlântico Leste*. Such a scenario is of particular concern, given that the Northeast's interior is already becoming drier and experiencing a seven-year continuous cycle of prolonged severe droughts from 2011-2017⁷⁴. It is also the area where family farming is concentrated and currently faces the country's most significant challenge regarding poverty eradication.⁷⁵ Projections estimate possible losses of up to 79.6% in agro-productive areas and subsequent increase in food insecurity and health issues due to climate change and maladaptive practices. (CEDEPLAR-FIOCRUZ, 2008). There is a significant correlation between average precipitation and agricultural production, but the effect is statistically significantly higher for crops produced by family farmers than average agricultural production. The average crop area lost due to droughts in the 1990-2016 period was 221,973 hectares per year.⁷⁶

Due to climate change, staple food crops, such as beans, corn and cassava, can suffer productivity losses up to 5% by 2030 in the Northeast, and some scenarios project that manioc can even disappear from the region⁷⁷. Projections indicate that while most crops including coffee, sugarcane, oranges and cotton will be affected maize and wheat will be the most severely impacted. (USAID, 2018) Main issues affecting agricultural productivity will arrive from increasing temperatures, changes in amount and distribution of rainfall, and increased droughts intensity and occurrence, maladaptation practices derived from agricultural intensification (e.g. with sub sequent deforestation

70 LACERDA, F. F.; et.al. Long-term Temperature and Rainfall Trends over Northeast Brazil and Cape Verde. **Journal of Earth Science & Climatic Change**, v. 6, n. 8, p. 296, 2015.

71 INPE. 2015. "Cenários de Mudanças Climáticas: Regionalização." Unpublished. São José dos Campos: Instituto Nacional de Pesquisas Espaciais.

72 RIBEIRO NETO, A; ROLIM DA PAZ, A; RAIMUNDO DA SILVA, E. Impactos e vulnerabilidade do setor de recursos hídricos no Brasil às mudanças climáticas. In: BRASIL. MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO (Eds) **Modelagem Climática e Vulnerabilidades Setoriais à Mudança do Clima no Brasil**. Brasília, Ministério da Ciência, Tecnologia e Inovação, (p. 189 – 240), 2016.

73 BRITO, S. S. B.; et.al. Frequency, duration and severity of drought in the Semiarid Northeast Brazil region, *International Journal of Climatology*, n. 2017, 2017.

74 RIBEIRO NETO, A; ROLIM DA PAZ, A; RAIMUNDO DA SILVA, E. Impactos e vulnerabilidade do setor de recursos hídricos no Brasil às mudanças climáticas. In: BRASIL. MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO (Eds) **Modelagem Climática e Vulnerabilidades Setoriais à Mudança do Clima no Brasil**. Brasília, Ministério da Ciência, Tecnologia e Inovação, 2016. p. 189 – 240.

75 IFAD - IPC-IG. Climate change and impacts on family farming in the North and Northeast of Brazil, Working Paper No.141, Brasília, IPC-IG, UNDP, IPEA, IFAD, 2016. (This study was commissioned and paid for by IFAD).

76 Young, Carlos Eduardo, 2019.

77 MACHADO FILHO, H. et al. **Climate change and impacts on family farming in the North and Northeast of Brazil. Working Paper 141**. Brasília: IPC-IG/UNDP; IFAD - Semear; IPEA, 61 p., 2016. (This study was commissioned and paid for by IFAD).

and soil erosion) will further affect NEB and its agricultural sector. This negative consequence is particularly relevant considering that the current productivity in the semiarid is already low; hence any further losses would mean a more significant threat to food security in the region, with consequent repercussions on both local and national food security.

From 2017 to 2030 a 10% precipitation reduction scenario could cause an average annual loss of R\$ 96.7 million in family farmer's agriculture production value. If the rainfall reduction is 20%, these losses increase to annual loss of R\$ 193.3 million in family farmer's agriculture production value.^{Error! Bookmark not defined.} Besides, the **expected climate changes may exacerbate** other environmental problems that already affect family farming in the semiarid, like animal breeding, wild plant gathering, soil degradation, pests, dissemination of diseases and weeds and desertification.

5.3 Adaptation

Low income family farmers, the target group of this project, face very harsh and difficult conditions for developing productive and sustainable livelihoods. NEB is considered the most vulnerable region to climate change in the country,⁷⁸ Family farms account for almost all (generally over 90%)⁷⁹ of agricultural properties in the drylands of Brazil. These farms are usually smallholdings, with a significant proportion of them covering less than twenty hectares⁸⁰. Despite some variants,⁸¹ they generally blend annual dryland agriculture harvesting food crops – mainly maize, beans and cassava – for home consumption and sale, in addition to raising livestock-. Families often have backyard gardens, a few fruit trees and poultry. Few also have small irrigated areas. There are 2 million family farms employing over 6.5 million people in the Northeast, covering a total of 28 million ha, which represent 52% of the value of production and 87% of the total labor in the sector.⁸²

In the Semiarid, brackish or salty groundwater is common. Around 25% of wells have freshwater (< 500 mg/l TDS⁸³), 33% are brackish (501 to 1,500 mg/l TDS), and 42% salty (> 1,500 mg/l TDS).⁸⁴ Thus an estimated 75% of the wells in the Semiarid are unfit for human consumption.

The climate change vulnerabilities are a result of the following sensitivity and adaptive capacity factors that exacerbate the impacts of climate change: 1) high poverty incidence and low absorption capacities of climate and economic shocks, 2) water scarcity and poor quality, 3) inadequate productive practices which further degrade the soil, and 4) deforestation of the Caatinga Biome depleting the ecosystem services. Superimposing the temperature rise, increase in droughts and rainfall variability upon pre-existing social-economic vulnerabilities place intense pressure on freshwater availability and quality in the region translating into losses of arable land, desertification, increased food insecurity and reduced local economic activities that lower farmers' income and result in rural exodus.

78 WWF and MMA. Índice de Vulnerabilidade aos Desastres Naturais Relacionados às Secas no Contexto da Mudança do Clima. 2017.

79 A study of the São Francisco do Sertão Territory in Bahia State shows that 90.7% of the properties consist of family farms (Articulação-Nacional-de-Agroecologia, 2018). In the Chapada do Vale do Itaim Territory of the Sertão in Piauí State, this reaches 92.7 % (SIDERSKY, 2017).

80 Using data from the 2006 Census of Agriculture 2006 conducted by the Brazilian Institute for Geography and Statistics (IBGE), a study of the São Francisco do Sertão Territory in Bahia State showed that 62% of the farms and ranches in this Territory cover between 0 and 20 hectares.

81 Particularly in Piauí, Ceará and Rio Grande do Norte States, there are areas where cashew tree groves are often found on family farms, in addition to shifting food crop plots and livestock. There is a territory in Bahia State where almost all family farms have areas set aside for perennial sisal plantations.

82 Agricultura familiar no Nordeste: uma análise comparativa entre dois censos agropecuários / Carlos Enrique Guanzirolí, Alberto Di Sabbato, Maria de Fátima Vidal. – Fortaleza: Banco do Nordeste do Brasil, 2011. 172p.

83 TDS – Total Dissolved Solids.

84 MME-CPRM-SERVIÇO-GEOLÓGICO-DO-BRASIL. Projeto Cadastro da Infra-Estrutura Hídrica do Nordeste. Relatório Preliminar - 1ª Etapa - 225.000 km2 - Versão Beta. Brasília: MME-CPRM-Serviço-Geológico-do-Brasil. Available at: https://www.cprm.gov.br/publique/media/hidrologia/m_apas_publicacoes/cadastramento_fontes_semiarido_brasileiro.pdf. 2003.

5.4 Mitigation

Brazil has the world's sixth largest greenhouse gas (GHG) emissions, releasing in 2016 2.3 billion tons of carbon dioxide equivalent (CO_{2e}), compared with 2.1 billion in 2015. In 2016 emissions were 8.9% higher than 2005, distancing the country from its Paris goal of reducing 37% of its carbon emission by 2025 compared to 2005 levels.⁸⁵ GHG emissions in Brazil are largely due to forest and grassland conversion, followed by the agricultural and fossil fuel combustion. Land-use change and agriculture accounted for 73% of all the carbon that was emitted in 2016.⁸⁶

Total emissions in the nine states of the Northeast accounted for a quarter of Brazil's total emissions (591.4 MtCO_{2e}) in 2016. Land use, land-use change and forestry (LULUCF) with 381.8 MtCO_{2e} (65%) was the major cause of emissions, followed by agriculture with 106.9 MtCO_{2e} (18%) and energy with 102.7 MtCO_{2e} (17%). Land-use change, specifically the deforestation of the Caatinga biome, represented almost 5% of the carbon emissions (28.2 MtCO_{2e}). With 93.7 MtCO_{2e} emitted, enteric fermentation represented 88% of the agricultural emissions and 16% of the emissions in the Northeast.

Finally, with 102.7 MtCO_{2e} emitted, the energy sector emissions in the Northeast are largely caused by fuel production, energy generation, road transport and the industrial sub-sector. Renewable biomass from waste material such as coconut husk, cashew nut shells as well as wood from sustainably managed forest plantations and agroforestry systems could be vital to helping the Northeastern states move towards more renewable sources of energy and halt deforestation of the Caatinga.

The project will contribute to the shift to low-emission sustainable development pathways by obtaining reduced emissions from land use, deforestation, forest degradation, and through sustainable forest management, and conservation and enhancement of forest carbon stocks. CRPS principles and practices will eliminate the slash and burn as a method of land clearing and will increase production of biomass and carbon sequestration. To implement the CRPS proposed, a reduction of free-roaming livestock, fodder storage as well as pasture rotation will be promoted. Stratified systems with trees can provide benefits to ruminant farms, since trees can be source of shade and shelter improving productivity by reducing heat stress in tropical climates. In addition, some tree species produce leaves and pods which are highly palatable to animals and are available during the dry season when pastures are of low nutritional quality. Native trees of the Caatinga improve weight gain and milk production.⁸⁷ Well managed pastures can improve the ecosystem services provided by the Caatinga, such as micro-climate regulation, carbon sequestration and fixation, pest and disease control, provisioning of water, the decomposition of wastes, natural pollination of crops and other plants and provisioning of raw materials (such as timber, oil seeds and fruits).

5.5 Climate risk category

The project is classified as "high risk" in accordance with IFAD guidelines and standards. This categorization responds to the review of current and projected climate impacts and vulnerability of NEB. It is affected by increased interannual variability of rain cycles, aggravated droughts, and is also affected by significant watershed and land degradation. The target population, rural smallholder and subsistence farmers are particularly affected due to their lack of access to resources to adapt to or recover from extreme climate event impacts. Climate change will potentially exacerbate the current low development in the region, for which the project must ensure adequate integration of adaptation and mitigation measures with a shift from "do no harm" towards "do more good". Financing from the GCF is crucial to overcome a vicious circle of poverty, underdevelopment and exposure to climate variability.

⁸⁵ CarbonBrief, 2018

⁸⁶ The Greenhouse Gas Emissions and Removals Estimates (SEEG), 2018. Available at: <http://seeg.eco.br>

⁸⁷ Araújo Filho, J. A. Manejo pastoril sustentável da caatinga. Recife, PE: Projeto Dom Helder Camara, 2013. 200 p.

6. RELEVANT POLICIES AND REGULATORY FRAMEWORK

6.1 Relevant Policies

The policies and programs that interact with the PCRP are described in the following paragraphs.

6.1.1 Poverty Reduction and Family Farming

The most prominent poverty reduction program is *Bolsa Família*, a conditional cash transfer program created Federal Government in 2004. It consists of financial assistance to poor families with pregnant women, children and teens between 0 and 17 years old with extremely poor per capita income.⁸⁸ The Program has three main axes: (a) income transfer to promote immediate poverty alleviation; (b) conditions that reinforce access to basic social rights in education, health, and social assistance; (c) and complementary programs to strengthen families, so the beneficiaries can overcome their social vulnerabilities.

Other federal Program is the National Program for Strengthening Family Farming (PRONAF), that was launched in 1996. In 2003 it was transformed to finance investments and current spending loans for individual and/or groups of family farmers in seventeen different modalities, including specific credit lines for women and youth. The program is operated through public banks, with the Bank of the Northeast (*Banco do Nordeste – BNB*) being the main financial agent in the North-eastern region. The program budget in 2017 was R\$ 27 billion to finance investments and short-term loans for family farmers.

In addition to *Bolsa Família* and PRONAF, other important programs which target family farmers include:

- a) the Agrarian Reform Program (*Programa Nacional da Reforma Agrária - PNRA*), under the responsibility of the National Institute for Colonization (INCRA), settles and registers families claiming land in the Unified Registration (*Cadastro Único*);
- b) the Agrarian Credit Program (Programa do Crédito Fundiário – PCF), a credit program that allows rural farmers to acquire their land to combating rural poverty and strengthen family farming;
- c) the Harvest Guarantee (*Garantia Safra*) Program, which allows families to receive a compensation in case of loss of harvest due to persistent drought or excess of rains;
- d) the Family Agriculture Price Guarantee Program (*Programa de Garantia de Preço da Agricultura Familiar - PGPAF*), which sets minimum prices for the main products of family agriculture;
- e) Proagro Plus Insurance (*Seguro Proagro Mais*) which protects credit takers of PRONAF in case of harvest loss. It is a multi-risk insurance, covering losses due to climatic adversities and diseases or pests while recognizing traditional production methods of family farmers, such as intercropping, traditional, local or creole cultivars.
- f) Food Purchase Program (*Programa de Aquisição de Alimentos – PAA*) creates an institutional market for products produced by family farmers and their organizations through a bidding system. The acquired products are donated to social institutions (hospitals, care institutions, schools) and people in situations of food and nutritional insecurity (who receive food baskets), or are destined to the formation of public stocks.

⁸⁸ Extremely poor households are defined by a monthly per capita revenue between R\$89 up to R\$178.

g) National School Meal Program (*Programa Nacional de Alimentação Escolar – PNAE*), requires that at least 30% dos of resources spent on school meals be acquired by Family farmers and cooperatives, and works with simplified procurement processes.

Other credit programs not necessarily oriented for family farmers, but that may also be available to them are: i) ABC Program for investments to reduce CO₂ emissions in agriculture; ii) Agriculture Modernization and Natural Resource Conservation Program⁸⁹; iii) Promotion of Technological innovation in agricultural production Program⁹⁰; iv) Program for Building and Expansion of Storage Infrastructure⁹¹; v) Agricultural Machinery Modernization Program⁹²; vi) Incentives for Irrigation and Greenhouse Production Program⁹³; and vii) Other credit lines for Cooperatives. The Bank of Brazil and BNDES are the main financial agents in public sector and usually provide funds for some of the Programs and credit lines already mentioned. As mentioned above, the Banco do Nordeste is also an active financial agent in the north-eastern region.

To stimulate the production and consumption of native products the federal government launched the National Plan to promote Socio-Biodiversity Supply Chains⁹⁴ and the Policy to Guarantee Minimum prices for Socio-biodiversity Products.⁹⁵ These programs identified 17 species used by gatherers (the so-called ‘extractivists’) communities from several biomes and guarantees a minimum value when the market price is lower than the minimum price established by the National Supply Company (*Companhia Nacional de Abastecimento – CONAB*).

6.1.2 Food and Nutrition Security

The Project is consistently aligned with the main policies and priorities for food and nutrition security at the national level.

The National Plan for Food and Nutrition Security (*Plano Nacional de Segurança Alimentar e Nutricional – PLANSAN*) is the main instrument of the Brazilian National Policy on Food and Nutrition Security.⁹⁶ The Plan summarizes the proposed actions to be taken by the federal government to respect, protect, promote and guarantee the right to adequate food to all Brazilians. The PLANSAN is guided by the National Policy on Food and Nutrition Security (PNSAN) and is built in an inter-sectorial manner by the Inter-ministerial Chamber of Food Security and Nutrition (CAISAN), that includes 21 ministries, on the basis of the priorities established by the National Council for Food and Nutrition Security (*Conselho Nacional de Segurança Alimentar e Nutricional – CONSEA*). Building on the achievements of the first Plan, and especially on its multisectoral approach, the PLANSAN II enhances its focus on key issues, such as: strengthening of agroecological food systems; supporting indigenous peoples and traditional communities’ access to public policies, especially those related to family farming; increasing the public purchase of food products from family farming – by strengthening PNAE and PAA; recognizing the significant contribution of women in agriculture and family farming, especially in the conservation of natural resources, and enhancing their access to public policies and; strong concern for availability of safe and clean water, including the revitalization of watersheds and springs.

6.1.3 Indigenous Peoples and traditional communities

The Brazilian Constitution assures the rights of the indigenous peoples. Their lands and rights to the lands are defined in the concept of original rights that are prior to the creation of the State itself. This is a result of the historical recognition that the indigenous peoples were the first occupants of Brazil. The constitution furthermore

89 Programa de Modernização da Agricultura e Conservação de Recursos Naturais – Moderagro.

90 Programa de Incentivo à Inovação Tecnológica na Produção Agropecuária – Inovagro.

91 Programa para Construção e Ampliação de Armazéns – PCA.

92 Programa de Modernização da Frota de Tratores Agrícolas e Implementos Associados e Colheitadeiras – Moderfrota.

93 Programa de Incentivo à Irrigação e à Produção em Ambiente Protegido – Moderinfra.

94 Plano Nacional para a Promoção das Cadeias de Produtos da Sociobiodiversidade.

95 Política de Garantia de Preços Mínimos para os Produtos da Sociobiodiversidade.

96 Established by Decree no.7.272 / 2010. PLANSAN I (2012-2015) was launched in 2015, followed by PLANSAN II (2016-2019).

sets out that the protection of indigenous peoples rights fall under federal governments' protection.⁹⁷ On an international level, Brazil has ratified the Convention 169 and voted in favor of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

Established in 2007, the National Policy for the Sustainable Development of Traditional Peoples and Communities (*Política Nacional de Desenvolvimento Sustentável dos Povos e Comunidades Tradicionais – PNPCT*) seeks to promote the sustainable development of traditional peoples and their communities, including indigenous peoples. One of the main implementation tools of the PNPCT is the Sustainable Development Plan, which aim to inform and guide the implementation of the Policy. In 2012, the Brazilian government launched the National Policy for Environmental and Territorial Management of Indigenous Lands (*Política Nacional de Gestão Territorial e Ambiental de Terras Indígenas – PNGATI*). The Policy calls for the environmental protection and full participation of indigenous peoples in all processes that affect their lands, stressing the need to request and obtain indigenous peoples' free, prior and informed consent (FPIC) before taking any actions in indigenous territories. The policy also provides for the participation of representatives of indigenous peoples in institutions in charge of regional and national environmental policies that affect their territories.

6.1.4 Water Access

As explained above, the semi-arid north-eastern region has age-old water scarcity problems which have been addressed, to greater or lesser extent, by a number of government programs and policies. A major infrastructure project, which is still being implemented, is the transposition of the São Francisco River, which started in 2007 and parts of which were inaugurated in 2017. This project diverted water from the San Francisco River to benefit 12 million people in four north-eastern states.

Both the One Million Cisterns Program by MDS and the Freshwater Program by MMA are billed to be key partners in this Project. The Cisterns Program, financed by the Ministry of Social Development (MDS) - actual Ministry of Citizenship (MC) since 2003, targets low-income rural families, affected by drought or lack of water, and residing mainly in the semiarid region. The program currently supports the deployment of more than 15 different types of 'social technologies'⁹⁸. Since its creation, more than 1 million water 'social technologies' have been implemented with Program support, including 877 thousand plate cisterns for household consumption, 145 thousand cisterns for food production and 5 thousand school cisterns. The Freshwater Program by the Environment Ministry, implements a permanent public policy aimed at accessing good quality water for human consumption in low-income populations of the semiarid, through the implementation, recovery and management of desalination systems since 2004. State Plans have the goal of serving 25% (2.5 million people) of the rural population of the semiarid by 2019. In the 2nd phase of the Freshwater Program (2019-2024), the goal is to have installed 1,727 desalination systems and to implement 103 'biosaline' productive units, benefiting approximately 1.19 million people.

Other water access program worth noting are the Sustentar Program and Salta-Z supported by FUNASA/Ministry of Health. These programs seek the sustainability of sanitation actions in rural areas, through the training of managers and operators in diverse alternatives of management, operation, maintenance and water quality control

97 Constitution from 1988, chapter VIII. Source: <https://pib.socioambiental.org/en/Constitution>

98 The concept of social technology (ST) ('Tecnologias Sociais' in Portuguese) was developed in Brazil during the decade of 2000. Although there is no official definition for this concept, it can be defined as a way to design, develop, implement and manage technology oriented to solve social and environmental problems. In more practical terms, STs are understood as products, techniques or methods that have a low cost and can be replicated, developed and/or applied in interaction with a community, which represent social transformation solutions through the sustainable use of local resources. Examples of STs are: small rainwater harvesting cisterns for domestic use and larger ones for backyard garden irrigation, ecological cooking stoves (*ecofogões*), farm water reservoirs (*barreiros trincheira*), household greywater treatment systems (*sistema bio-água de reuso*), underground water barriers (*barragens subterrâneas*).

(FERNÁNDEZ, L. et al. Synergies and trade-offs between climate change mitigation and adaptation strategies: lessons from social technologies in the semiarid region of Bahia, Brazil, Latin America. *Latin American J. Management for Sustainable Development*, v. 3, n. 1, p. 1-18, 2016; and REDE-DE-TECNOLOGIA-SOCIAL, Ed. *Tecnologia Social e Desenvolvimento Sustentável: contribuições da RTS para a formulação de uma política de Estado de Ciência, Tecnologia e Inovação*. Brasília, DF: Secretaria Executiva da Rede de Tecnologia Social (RTS)ed. 2010.

of the water supply systems. In addition, the Sustentar Program involves the community served, with education in health and environmental sanitation. The National Water Agency (*Agência Nacional de Águas – ANA*) indirectly stimulates the Payment of Environmental Services policy, and directly supports the construction of infiltration terraces and basins, the re-adaptation of vicinal roads, the recovery and protection of springs, the reforestation of permanent reforestation of permanent protection areas and legal reserves, environmental sanitation, rural sanitation projects and collection and recycling of waste as a way of preserving water resources.

The National Policy to Combat Desertification and Mitigation of Drought Effects and its instruments, as well as the National Commission to Combat Desertification (CNCDD), were sanctioned in July 2015. This law instructs how to map and diagnose desertification processes, including land degradation in arid, semiarid and dry sub-humid areas resulting from various factors and vectors, including climatic variations and human activities.

6.1.5 Climate Change

In 2015, Brazil submitted its Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC). Brazil is committed to reducing greenhouse gas (GHG) emissions by 37% below 2005 levels by 2025 and, as a subsequent indicative contribution, to reducing GHGs by 43% below 2005 levels by 2030. The Government of Brazil (GoB) is committed to the implementation of its NDC, including full respect for human rights and the rights of vulnerable communities, indigenous peoples, traditional communities and workers in sectors affected by corresponding policies and plans, and is promoting gender-transformational measures. The Federal Government is equally committed to achieving its NDC targets as it works to eliminate extreme poverty and reduce inequality. A large part of the NDC target is based on reducing emissions from deforestation and degradation (REDD).

The NDC goals reaffirm some prior Brazilian commitments and update others. Indeed, most of the Brazilian targets are already embedded in existing laws and national plans. Including them in the NDC is important to inform the international community about Brazil's ambitions to strengthen and consolidate these policies in domestic debates and to attract investment to meet the goals.

The NDC's goal of restoring and reforesting 12 million ha (7 million ha of tree plantation plus 5 million ha of restoration) will be accomplished by complying with its Native Vegetation Protection Law ("Forest Code"), and the subsequent National Plan for Restoration of Native Vegetation (PLANAVEG). According to the Forest Code, some set-aside areas - e.g. Legal Reserves (*Reservas legais - RLs*) and Permanent Preservation Areas⁹⁹ (*Áreas de Preservação Permanente - APPs*) – for conservation can be sustainably harvested and include the partial use of exotic species, such as pines and eucalyptus, interplanted with native species, which could mitigate the cost of restoration and even provide profits. The implementation of PLANAVEG should contribute to the achievement of this commitment, regarding the recovery of the native vegetation of APPs and RL and areas of low agricultural productivity.

PLANAVEG applies the same logic used to define the national recovery goal of 12 million ha to regionalize this amount among the six Brazilian biogeographic regions. The values indicate that most of the defined recovery goal is concentrated in the Amazon and Atlantic Rainforest (76%), while the *Cerrado* represents 17%, the *Caatinga*, 4% (500,000 ha), and the remaining 3% divided among the *Pantanal* and *Pampa*. PLANAVEG recognizes that in the family agriculture context, "the implementation of agroforestry systems for the composition of Legal Reserves can also contribute to food security, nutrition, income, health, shelter, social cohesion, energy resources, and environmental sustainability." Other relevant instruments of the Forest Code are the Environmental Rural Registry (*Cadastro Ambiental Rural - CAR*) and the Environmental Compliance Program (*Programa de Regularização Ambiental - PRA*).

99 APPs are mandatory on hilltops, steep slopes, coastal shrublands, mangroves, wetlands, around springs, and along watercourses and reservoirs.

The social dimension is at the core of Brazil's adaptation strategy, bearing in mind the need to protect vulnerable populations from the negative effects of climate change and enhance resilience. In this context, Brazil is working on the design of new public policies, through its National Adaptation Plan (*Plano Nacional de Adaptação à Mudança do Clima – PNA*), in its final elaboration phase. The strong involvement of stakeholders, at all levels, will contribute to the formulation and implementation of Brazil's National Adaptation Plan.

In this context, the country National Adaptation Plan puts forward cross-sector adaptation strategies to address the wide range of risks that climate change is creating and is the means to implement the adaptation aspect of the National Determined Contribution. The National Adaptation Plan also will establish guidelines to implement adaptive measures to increase climate resilience in 11 sectors and themes.

The NDC presents the strengthening of the Low Carbon Emission Agriculture Program (*Plano ABC – Agricultura de Baixa Emissão de Carbono*) as the main strategy for sustainable agriculture development and commits to restoring 15 million ha of degraded pasturelands, enhancing 5 million ha of integrated cropland-livestock-forestry systems and restoring and reforest 12 million ha of forests by 2030. The ABC Plan is one of the sectorial plans devised under the National Policy on Climate Change. Its overall objectives are: reducing greenhouse gas emissions in agriculture; improving the efficiency in the use of natural resources; increasing the resilience of production systems and rural communities; and promoting adaptation to climate change in the sector. One of the main instruments of the policy is the National Plan of Agroecology and Organic Production (*Plano Nacional de Agroecologia e Agricultura Orgânica – PLANAPO*), known under the name of 'Agroecological Brazil', that was conceived with the participation of various sectors of civil society.

6.2 Regulatory Framework

6.2.1 Environment

The Brazilian legal system had its first environmental milestone with the edition of Law nº 6.938/81, which instituted the National Environmental Policy (PNMA). PNMA has instituted the environment as a specific object of protection, as well as the National Environment System - Sisnama, a set of bodies able to plan an integrated action for the sector. In addition, it established the obligation of the polluter to repair the damage caused and the user to contribute by the use of environmental resources for economic purposes (art. 4th, VII), without prejudice to administrative sanctions (art. 14, §1º).

Subsequently, the Federal Constitution of 1988 dedicated a chapter to the environment, imposing a duty on the public authorities and the community to defend the environment and preserve it for present and future generations (art. 225). Article 225 also imposes on the public authorities several obligations in order to ensure the effectiveness of the right to the ecologically balanced environment, among them the preservation and restoration of essential ecological processes and the promotion of ecological management of species and ecosystems (§1st). It also obliges individuals or legal entities that practice conduct and activities considered harmful to the environment to repair environmental damage caused, without prejudice to criminal and administrative sanctions (§3rd).

Other legal acts, such as laws, decrees, resolutions and ordinances, also address environmental issues and form the set of environmental standards in Brazil. Such rules may be either federal, state or municipal, since the Union and the States have concurrent competence to legislate on forests, nature conservation, soil and natural resource protection, pollution control and others (art. 24, VI, CF), and municipalities have the power to legislate on matters of local interest (art. 30, II, CF).

And yet, the executive competence to protect the environment is common among Union, States, Federal District and Municipalities (CF, art. 23, VI). Thus, these entities can and should enforce environmental standards, and also promote liability actions against those who do not comply with current environmental legislation.

6.2.1.1 Flora

The protection of the flora is guaranteed by the CF to the extent that it is up to the Government to ensure the right of all to the environmentally balanced environment. Thus, the CF prohibits practices that endanger their ecological function or cause the extinction of species (art. 225, §1, VII).

Prior to CF, forests and other vegetation were already protected by provisions of the Forest Code, Law n° 4.771/65. Law n° 12.651/2012¹⁰⁰ has recently dealt with the issue, providing for the protection of native vegetation and repealing numerous norms through sensitive modifications to the forest protection regime.

The new Forest Code then maintained the determination of forest replacement, already regulated by Decree n° 5.975/2006, which provides that it is the compensation of the volume of raw material extracted from natural vegetation by the volume of raw material resulting from forest planting for generation of forest cover or recovery, being mandatory for the natural or legal person that uses forest raw material from natural vegetation suppression or that holds the authorization of natural vegetation suppression (art. 13 and 14).

One of the forms of flora protection is the obligation of environmental authorization for vegetation suppression and its consequent forest replacement. In this sense, the law stipulates that the suppression of native vegetation for alternative land use, whether public or private domain, will depend on the registration of the property in the CAR (Rural Environmental Registry)¹⁰¹ and prior authorization of the competent state agency of Sisnama (art. 26).

6.2.1.2 Specially Protected Territorial Areas

a) Permanent Preservation Areas

Article 225 of the CF determined as the responsibility of the Government, the definition, in all units of the Federation, of territorial spaces and their components to be specially protected (§1, III).

Within this concept, the new Forest Code (Law n° 12.651/2012) defined the Permanent Preservation Area (APP) as the protected area, covered or not by native vegetation, with the environmental function of preserving water resources, the landscape, geological stability and biodiversity, facilitating the gene flow of fauna and flora, protecting the soil and ensuring the well-being of human populations (art. 3º, II). These spaces, among which we can highlight the marginal strips of watercourses; the surroundings of artificial springs and reservoirs; the restingas; the tops of hills; and slopes greater than 45º are subject to specific regulation.

It is important to respect the non-suppression of PPAs given that the Environmental Crimes Law typifies the action of destroying or damaging forests considered permanent preservation, even if in formation, or using it in violation of protection norms, with penalty of detention and fine (art. 38 of Law n° 9.605/98).

b) Legal Reserve

Another especially protected territorial space is the so-called Legal Reserve. The Legal Reserve is the area located inside a rural property or possession, with variable length according to criteria established in the code itself. The Legal Reserve's function is to ensure the sustainable economic use of the rural property's natural resources, to

¹⁰⁰ Provides for the protection of native vegetation; amends Laws n° 6.938/81, 9.393/96 and 11.428/2006; repeals Laws n° 4.771/65 and 7.754/89, and Provisional Measure n° 2.166-67/ 2001.

¹⁰¹ Created by Law n° 12.651/2012 and recently regulated by Decree n° 8.235/2014 and Normative Instruction MMA n° 02/2014, the CAR is an instrument of the National Rural Environmental Registry System (SICAR), mandatory electronic registration for all rural properties, which its purpose is to integrate environmental information regarding the status of the PPAs, Legal Reserve areas, forests and remnants of native vegetation, Restricted Use Areas and consolidated areas of rural properties and holdings in the country.

assist in the conservation and rehabilitation of ecological processes and to promote the conservation of biodiversity, as well as the shelter and protection of wildlife and native flora (art. 3rd, III, of Law nº 12.651/2012).

c) Conservation Units

In addition to APPs and Legal Reserves, Conservation Units are also classified as specially protected territorial spaces.

Conservation Units were created by Law nº 9.985/2000, which established the National System of Conservation Units (SNUC), and are defined as territorial spaces and their environmental resources, including jurisdictional waters, with relevant natural characteristics, legally established by the Government, with conservation objectives and defined limits, under special management regime, to which adequate guarantees of protection apply (art. 2nd, I).

The SNUC Law has divided Conservation Units into two groups with specific characteristics: (i) integral protection units, including the Ecological Station, the Biological Reserve, the National Park, the Natural Monument and the Wildlife Refuge; and (ii) sustainable use units that include the Environmental Protection Area, the Area of Material Ecological Interest, the National Forest, the Extractive Reserve, the Fauna Reserve, the Sustainable Development Reserve and the Private Natural Heritage Reserve.

The same provision also defined the obligation for almost all species of Conservation Units to have a management plan, buffer zones and ecological corridors.

Regarding the so-called buffer zones, the SNUC Law defines them as being around a conservation unit, where human activities are subject to specific rules and restrictions, with the purpose of minimizing the negative impacts on the unit (art. 2nd, XVIII), and its limits may be defined in the act of creation of the unit or later (art. 25, paragraph 2nd).

- Brazil has also specific legal instruments for biodiversity conservation, such as National Biodiversity Policy – Decree nº 4.339/2002,
- National Program for Biological Diversity
- National Biodiversity Commission - Decree 4703/2003),
- Decree 2519, which enacts the Convention on Biological Diversity (CBD).

6.2.1.3 Water Resources

The Federal Constitution determined that it is competence of the Union to establish a national water resources management system and to define criteria for granting rights to its use (art. 21, XIX).

In this sense, Law nº 9.433/97 was enacted, which established the National Water Resources Policy (PNRH) and created the National Water Resources Management System (SNGRH). The Law also established principles, objectives, guidelines and instruments for the management of water resources. It should be noted the observance of two fundamentals of PNRH: the multiple use of water and the recognition of water as a good of economic value, that is, its use through financial consideration (art. 1st, IV and V).

The first presupposes that water resources management provides for multiple water use, i.e. the water supply by the Union and the States must be in line with this principle. The management of water resources based on multiple use also presupposes that the use of water resources is granted, as these uses can often be concurrent, generating conflicts between user sectors or even environmental impacts.

The granting of rights to use water resources was regulated by CNRH Resolution nº 16/2001, which defined it as the administrative act by which the granting authority grants the grantee the right to use water resources, for a specified period (art. 1st).

The link between quality management and water quantity management occurs through the framing of water bodies in predominant use classes, because by fitting a body of water into a particular use class, therefore, if the maximum allowable concentrations of each pollutant in the same.

In this regard, the following standards must be observed: Decree n° 79.367/77, which provides for standards and the standard of water potability; Conama Resolution n° 274/2000, which provides for the classification of freshwater, brackish and saline waters throughout the National Territory, as well as determines the release standards; Conama Resolution n° 357/2005, which provides for the classification of water bodies and environmental guidelines for their framing, as well as establishes the conditions and standards of discharge of effluents; and Resolution CNRH n° 91/2008, which provides for the general procedures for the framing of surface and underground water bodies.

6.2.1.4 Environmental Licensing

Environmental licensing was instituted by Law n° 6.938/81 as one of the necessary instruments for the protection and improvement of the environment (art. 9th, IV), as it verifies the possibility of negative environmental impacts caused by the construction, installation, expansion and operation of establishments and activities that use environmental resources, as well as establishes the necessary measures for their prevention, repair and mitigation.

Environmental licensing is the procedure whereby the competent environmental agency licenses a potentially polluting activity after technical analysis, which imposes on the entrepreneur a series of measures aimed at maintaining the ecologically balanced environment. Thus, the scope of environmental licensing is to reconcile economic development with environmental preservation.

To discipline the environmental licensing aspects established in PNMA, Conama Resolution n° 237/97 was issued, which deals specifically with environmental licensing.

Failure to comply with any conditions, restrictions, requirements and environmental control measures defined by the environmental agency as conditioning factors may lead to the suspension or cancellation of the licenses related thereto, without prejudice to civil, administrative and, in certain cases, criminal liability.

a) Environmental licenses or permits

The Conama Resolution n° 237/1997 establishes all the steps that must be followed in the licensing process (art. 10) and defines the environmental licenses to be issued by the competent environmental agency, namely the Preliminary Licenses - LP, Installation - LI and Operation - LO (art. 8th).

The LP is granted in the preliminary phase of the project planning, where the environmental agency approves, through mandatory prior inspection, the location and design of the project, certifies the environmental viability from the analysis of possible environmental impacts and establishes the basic requirements and conditions. to be met in the next phases (art. 8th, I).

After analyzing the specifications contained in the plans, programs and projects presented, including the environmental control measures and compliance with the conditions established in the LP, the environmental agency will issue the LI, authorizing the installation of the project (art.8th, II).

Finally, the LO will be granted after the verification of the effective compliance with the conditions of the previous licenses, authorizing the operation of the project (art. 8, III), after verification of the effective compliance with what the previous licenses determine, such as the control measures. conditions and conditions determined for the operation.

It is emphasized that it is essential to observe the conditions, restrictions, requirements and environmental control measures required by the environmental agency as conditions in the licenses, given that their failure to comply may result in the cancellation of the license, civil and administrative liability and, in certain cases, criminal liability.

In addition to the licenses provided for in Conama Resolutionn° 237/97, the licensing process also requires the issuance of authorization for the capture, collection and transportation of fauna; land use certificate; authorization for vegetation suppression; authorization for archaeological prospecting and salvage and reserve of water availability / granting the right to use water resources, among others.

Specifically about this Project, an emergency measure has been taken by every state of the semiarid stating that all infrastructure works and activities aimed at mitigating the effects of droughts are either exempt of the environmental licensing process or have a simplified licensing mechanism in place. For avoidance of doubt, national legislation and the legislation applicable to the states must be observed; at time of design, the following activities considered in the project are exempted from environmental licensing:

- Construction and installation of cisterns, dams and other equipment for the abstraction and retention of water of any kind, shape or model.
- Implementation of irrigated production systems using micro sprinkler or drip technology in areas of up to 1 ha (one hectare),
- Installation and recovery of wells up to 50 m deep, as well as artificial reservoirs, dams or barriers, with up to 2 ha of water surface;
- Purchase of animals with health certificates issued by the responsible bodies
- Works and services of soil correction;
- Construction of fences, corrals and machine sheds;
- Agricultural and livestock activities carried out in dry regions that are not subject to irrigation, will be exempt from environmental licensing according to the State Laws in the semiarid.

The activities contemplated in the project must comply with the following regulations at the federal and state levels:

Bahia

According to Law 10,431/2006, undertakings and activities necessary to mitigate the environmental, social and economic effects of an emergency or public calamity resulting from drought shall follow a specific procedure for simplified environmental licensing. The application for the simplified environmental licensing should be addressed to the Institute of Environment and Water Resources – INEMA.

Ceará

The State Council for the Environment- COEMA, through resolution No. 01 of February 2018 establishes a review of the procedures for Simplified Environmental Licensing for emergency works required to cope with drought in the State of Ceará. The State Superintendence of the Environment – SEMACE will proceed to the analysis of the framework of the application of the Resolution COEMA N° 10 of June 11, 2015.

Paraíba

According to the administrative standard N° 125 of 2015 issued by SUDEMA (Paraíba's environmental authority), cisterns, small dams and public works considered goods of common use - such as desalination facilities, are exempt from environmental licensing process provided they do not involve further deforestation or environmental degradation.

Pernambuco

Decree No. 38146 of 2012 establishes procedures for the Simplified Environmental Licensing of emergency works necessary to confront drought in the State of Pernambuco. The State Agency for the Environment - CPRH will analyze the framework of the application.

Piauí

The Secretariat of Environment and Water Resources - SEMAR will analyze the framework of the application of Decree No. 14921 from 2012 which regulates the Simplified Environmental Licensing for the same activities mentioned above.

Rio Grande do Norte

Institute of Sustainable Development and Environment of Rio Grande do Norte -IDEMA, through Ordinance No. 55 of 2013, resolves the activities and circumstances under which a Simplified Environmental Licensing applies.

Sergipe

The Council of Environment of the State of Sergipe- CEMA / SE will analyze the framework of the application of Administrative Standard. 01/2009.

6.2.2 Contribution to the regulatory framework and policies

The Project will help Brazil achieve its NDC and the targets of the Low-carbon Agriculture Program (ABC). CRPS principles are a viable option for smallholders to fulfil their legal obligations under the Brazilian Forest Code (FC). The Project will support beneficiaries to overcome the challenges they face (e.g., lack of technical support and incomplete fiduciary documentation) to fully comply with the national regulatory framework.

The project will strengthen regulatory frameworks by implementing the instruments established in Brazilian Forest Code (Law 12651/2012). The Forest Code governs the use and protection of private lands in Brazil. It is one of the most important pieces of legislation with the potential to drive efficient land use in Brazil and, in doing so, become an effective tool against climate change.

Under this Code, rural properties play an important role in biodiversity and natural resource conservation, as owners must maintain 20% native vegetation of their total land area in the *Caatinga* Biome. These “Legal Reserves” (LR) are intended to preserve forested areas and their ecosystems, thus contributing towards an enhanced ecological balance and avoiding deforestation emissions. In addition, rural properties have to map and leave Permanent Preservation Areas (APP in Portuguese) intact, being areas that have been designated for protection because they have been identified as critical to the preservation of essential ecosystem functions, such as the preservation of water resources, landscapes, geological stability, biodiversity, genetic flows for fauna and flora, soil protection and safeguarding the wellbeing of human populations. Examples of APPs are riparian zones, springs, hilltops, steep slopes and mangroves. Each rural landholding is thus required to have an environmental rural registry (CAR – the Portuguese acronym), which is an electronic register of georeferenced information about a rural property. The CAR integrates environmental information regarding the property (such as the LRs and APPs) to assist in monitoring and combating deforestation and degradation of native vegetation in private rural properties. The CAR is essential to access rural credit from financial institutions.

However, many properties have yet to meet these requirements: they either don’t have a CAR yet or there is a deficit regarding the LR, or a degraded APP that cease to provide environmental services. Embrapa researchers found that family farmers face some particular barriers when it comes to the implementation of the forest code

such as low education level of the farmers, lack of technical support, and incomplete fiduciary documentation¹⁰². The small size of these farms is also an issue, as preserved areas are not fully available for cropping and grazing. In this general context, the extension agents providing support to the farmers in this Project will work with all beneficiaries to ensure they become (are) fully compliant with the forest code. Smallholding family farmers are entitled to a slightly more flexible rule, that enables them to include certain types of production within their LR. According to research, the CRPS principles proposed by the Project are a viable option for smallholders to both fulfil their legal obligations to conserve and/or restore land within the Forest Code and maximize livelihoods and other benefits¹⁰³. The CRPS proposed here are completely aligned with the Low-Carbon Agriculture (ABC) program.

The Forest Code also established another instrument that has only been implemented by one state in Brazil (Mato Grosso do Sul), the *Cotas de Reserva Ambiental* (CRA, Environmental Reserve Quotas)¹⁰⁴. The CRAs¹⁰⁵ are a market mechanism of offsetting that can be an effective conservation tool rewarding farmers that sequester carbon or avoid deforestation emissions¹⁰⁶. This CRA market could potentially reduce the country's overall LR 'debt' by 56%¹⁰⁷. Given the high costs of forest restoration, exchange of CRAs could become a cost-effective way to facilitate compliance, meanwhile protecting forest surpluses that might otherwise be legally deforested. A balanced use of CRAs should focus on improving functional and ecological attributes of forested landscapes, e.g., habitat integrity (and thus biodiversity), carbon stocks, and water balance regulation.

The Project will fund activities designed to facilitate the development of a roadmap to implement the CRA market. Depending on these roadmaps, additional studies may also be funded by the Project to define priority areas, flexible compensation rates, definition of ecological value among others. In addition, all families participating will obtain the CAR, an instrument that is crucial for the implementation of the Forest Code.

The Low-carbon Agriculture (ABC) program and the Forest Code are the two most important instruments for achieving the NDC. Once state regulators and extension agents understand the possibilities and benefits of the CRPS principles implemented by the Project, they will be better equipped to oversee and support the implementation of the new Forest Code (to other non-beneficiaries of the project) and the ABC program and therefore generate consistent services and policy.

6.3 Adherence to GCF principles

6.3.1 Consistency of the assessment with IFC Performance Standards (PS1-PS8)

For the sake of a better comparability and evaluation the ESMF will work with the GCF adopted performance standards, a comparability and equivalence table is presented in the following section.

The PCRPs interventions analysis evaluated the convenience to trigger the following performance standards as a precautionary measure:

102 LOPES, S. R. M.; BRIENZA JR., S. A Regularização Ambiental e o Agricultor Familiar na Amazônia Legal a Partir da Lei Nº 12.651 de 2012. Belém, PA: Embrapa Amazônia Oriental, 2017.

103 MICCOLIS, A. et al. Restoration through Agroforestry: Options for Reconciling Livelihoods with Conservation in the Cerrado and Caatinga Biomes in Brazil Experimental Agriculture, n. 2017 - Online. Available at: <https://doi:10.1017/S0014479717000138>, p. 1 - 18, 2017.

104 GASPARINETTI, P.; VILELA, T. Implementando Mercados de Cotas de Reserva Ambiental (CRA): Desafios e oportunidades para as Regulamentações Estaduais. Documento de Discussão. Available on-line at: http://www.observatoriodoflorestal.org.br/content/uploads/2018/05/PORT_documento_de_discussao_CRA_CSF_Fev2018.pdf. Conservation Strategy 2018

105 Each Forest Reserve Credit represents one hectare (1 ha) of forest Legal Reserve, that is surplus to the amount required by law to be maintained in any given rural property.

106 The CRA market can potentially reduce the country's overall Legal Reserve 'debt' by 56%.

107 SOARES FILHO, B. et al. Cracking Brazil's Forest Code. *Science*, v. 344, p. 363 - 364, 2014.

6.3.2 Performance Standard 1: Assessment and Management of Environmental and Social Performance

Performance Standard 1 highlights the importance of managing environmental and social performance throughout the life of a project. The ESMF identifies the key risks at the design stage e.g. a list of potential negative impacts, that is subject to continuous enhancement during the course of project implementation. As a result the Environmental and Social Management System (ESMS) to be implemented should involve the engagement between the government, workers involve in the implementation and/or local communities potentially affected by the project.

The central project management unit CPMU, through PMEL, in coordination with other responsible government agencies and (potential) third parties will conduct a process of environmental and social assessment, and establish and maintain the ESMS i.e. SECAP, appropriate to the nature and scale of the PCRPP and its potential changes in the course of implementation, and commensurate with the level of its environmental and social category. In line with PS 1 and IFAD SECAP the concept of continuous improvement will be an ongoing process throughout the life of the project, correcting and improving following a Plan-Do-Check-Act cycle (PDCA). Besides, the Environment and Social Management Plan (ESMP) and relevant studies will be disclosed along with the stakeholder engagement plan and the appropriate grievance mechanism.

In addition to meeting the requirements under the PS1, the PCRPP will comply with applicable national and international laws as discussed in the previous section.

6.3.3 Performance Standard 2: Labour and Working Conditions

Performance standard 2 has been triggered in anticipation of the activities that will be funded in activities 1.1.2. Implement CRPS in family farms and backyard gardens, 1.1.3. Implement Collective Resilient Investments, 2.1.1. Build boardwalk cisterns for backyard gardens, 2.1.2. Implement social technologies to increase water in the field during periods of drought, and 2.1.3. Implement treatment and reuse systems for household wastewater.

All potential contractors or communities participating will be required to follow national occupational health and safety regulations and/or the WB EHS. PS2 will be reassessed at the implementation stage to determine if the work planned will require adjustments to avoid the use of child or forced labour, and identify risks in their primary supply chain that are under the scope and responsibility of the PCRPP

6.3.4 Performance Standard 3: Resource Efficiency and Pollution Prevention

The project considers the implementation of Climate Resilient Productive System (CRPS) and also supports the construction of water harvesting storage and treatment facilities for waste water. CRPS promotes sustainable agriculture and will support good practice in fertilizers usage in the areas of influence of the project. The project will not support the use of pesticides. Also the water related infrastructure planned is very local and small in scale given the local needs.

However, the project will revert to the possibility to trigger this PS during the implementation phase to avoid any potential misuse of the resource and prevent pollution.

6.3.5 Performance Standard 4: Community Health, Safety, and Security

The PCRPP promotes the practice of a climate resilient agriculture, nevertheless as part of the project execution, fertilizers may be used for increased crop productivity, or indirectly, by increasing the availability of short-term credit for farm inputs or water for irrigation, which may increase the use of fertilizers. However careful selection of the type of agrochemicals and management of their use (timing, dosage, mode of application, etc.) will be promoted.

The PCRPP will not support any usage of pesticides and will place special emphasis to discourage the use of any one included in the United Nations' list of persistent organic pollutants (POPs) targeted for elimination from the global market. PCRPP will also facilitate the International Code of Conduct on the Distribution and Use of Pesticides to be adopted by the project if need be

The small infrastructure proposed in the project does not represent any risk for local communities. However, the construction of the proposed facilities will be preceded by capacity building that will include safeguards compliance.

6.3.6 Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Given the fundamental importance of the Caatinga and in line with IFAD corporate mandate the PCRPP activities will not take place inside strictly protected areas. The projects financed will evaluate the selection sites taking into account not only the presence of protected areas under SNUC and IUCN categorization but also the buffer zones and biodiversity sensitivity areas.

When in the nearby of a buffer zone the project will review the planned activities against the national protected area classification and the IUCN category before proceeding, to promote the contribution to areas adjacent to buffer zones.

6.3.7 Performance Standard 7: Indigenous Peoples

The Northeast region, where the PCRPP will take place, is home of a total of 233,079 indigenous individuals (26% of the total indigenous population), representing 80 indigenous peoples' groups¹⁰⁸. At the present stage of the Project design process it is still not possible to identify which indigenous peoples' groups and communities will be targeted. This will depend on the geographic coverage of Project's interventions that, at the same time, will depend upon states' participation.

Nevertheless, anticipating the potential inclusion of indigenous groups in the project areas an Indigenous People Planning Framework (IPPF) has been developed. The IPPF aims to provide guidance to the preparation the Indigenous Peoples' Plans that will be designed, together with indigenous peoples' communities, once the Project area and the indigenous peoples' groups are identified. The IPPF for the current proposal, therefore, shall be considered a working document that is expected to be iterated and shaped through inputs by the indigenous peoples, their communities and their organizations who will be directly involved in the Project.

The IPPF is attached to the ESMF.

6.4 Adherence to IFADs principles

The PCRPP ESMF sets out actions to implement mitigation measures and monitoring and reporting measures on performance, institutional and organizational arrangements. It aims to address measures for information disclosure, grievance redress mechanism, and the process for continued consultation and participation of affected people during project implementation. Thus, the potential risks and impacts identified may be subject to change based on empirical information obtained on the ground and feedback received during project implementation. Periodic evaluations will be made with stakeholders (especially those who are most vulnerable) so that social and environmental risks can be more clearly avoided and strategies can be developed to overcome possible obstacles (as detailed in the Stakeholder Plan). The project's Advisory Committee and Consultative Council will play an

¹⁰⁸ IBGE, Brazilian National Census, 2010

important role in receiving and channeling concerns and demands of specific groups (ex: indigenous/ quilombola communities/ women).

Table 2 Equivalence of triggered IFAD and GCF safeguards.

IFC Performance Standard	IFAD corresponding policy/Instrument	Project applicability
Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts	Environmental and Social Management Plan	The project developed an ESMP matrix (Section 7)
Performance Standard 2: Labour and Working Conditions	Environmental and Social Management Plan	The project will promote compliance with national employment and labour laws. It will also promote safe and healthy working conditions, will aim to distribute well work responsibilities avoiding overburdening certain members of families (ex: women) in Territorial Resilience Investment Plans (TRIPS) and Climate Resilient Production Systems (CRPS).
Performance Standard 3: Resource Efficiency and Pollution Prevention	Guidance Statement 2 – Agrochemicals	A fertilizer and waste management Plan is pending the final decision of intervention areas.
Performance Standard 4: Community Health, Safety, and Security	Guidance statement 7 – Water (agricultural and domestic use) Guidance statement 14 – Community health	Guidance on mitigation measure for reducing the possible negative environmental impacts of projects which mobilize surface water or groundwater for irrigation will be prepared up on ground truthing. However, Rainwater harvesting or improved rainfed farming systems investments are typically in less need for mitigation. Preventive and control measures consistent with good international industry practice will be evaluated prior the project implementation to avoid potential impacts during the construction phase of cisterns and the deeply excavated reservoirs and also in the implementation and operation of grey and black water
Performance Standard 7: Indigenous Peoples	Indigenous Peoples Plan	IPPF has been prepared and will be shaped through inputs of IPs populations once project areas are defined

7. ASSESSMENT OF POTENTIAL IMPACTS

7.1 PCRPs Environmental and social category

IFAD has three categories (A, B, C) defined according to the likely significance of potential impacts from environmental and social risks. Guiding questions for environmental and social risk classification are found in the SECAP. Based on the guiding questions (please see Appendix 2 of this document) and a thorough analysis of the components potential impacts the PCRPs was categorized as B. That is, the project may have some adverse environmental and/or social impacts on human populations or environmentally significant areas, but the impacts:

- are minor to moderate;
- are site specific and none are irreversible in nature; and
- can be readily remedied by appropriate preventive actions and/or mitigation measures.

This SECAP/ESMF will ensure that all infrastructure investment is fully compliant with GCF's, BNDES's, IFAD's and national social and environmental standards. In particular, all water harvesting and storage investment in Component 2 will be designed not to interfere with ecological water flows or natural drainage of water bodies. No wells will be drilled by the project. All water harvesting and storage technologies implemented by the project have been applied in the semiarid and shown to have minimal negative environmental impact while providing significant positive gains in human wellbeing. For instance, the environmental impact found in an Embrapa study of the underground storage was an increase in energy use due to improvement in productive conditions.¹⁰⁹

The climate resilient productive systems (CRPS described in Appendix A) will promote improved soil and water management, reduction of agrochemical uses and ecosystem restoration. What is more, no expansion of agricultural land use is expected. Once project areas are defined, an indigenous peoples plan (IPP) will be unfolded prior to any intervention.

7.2 Potential E&S Impacts

The CRPS and water harvesting and storage technologies selected for this project aim to make productive activities compatible with environmental protection. However, there may be potential environmental and social consequences during the implementation that needs to be avoided or mitigated.

The main impacts that can be caused by this project activities are listed below:

1. Pressure on land ownership: the expectations and uncertainties generated in the society by the success of the implementation of the project can lead to increase in property values, provoking land speculation in the real estate market and even land conflicts. This may hinder the project's beneficiaries if their land tenure is not secure.
2. Irregular occupation of indigenous lands, quilombolas or settlement: The area of implementation of the project may be occupied by different traditional communities, such as quilombola communities and indigenous populations, whose ways of life and the history of mobilization related to the process of guaranteeing their territories and their rights. The project will prioritize working with these vulnerable communities. Some of these communities don't have their land rights settled, which can generate conflicts

109 RELATÓRIO DE AVALIAÇÃO DOS IMPACTOS DAS TECNOLOGIAS GERADAS PELA EMBRAPA. Barragem Subterrânea: uma opção de sustentabilidade para o semiárido do Nordeste. Unidade: Embrapa Solos. Equipe de Avaliação: Igor Rosa Dias de Jesus, Ana Paula Dias Turetta, Veramilles Aparecida Faé e Maria Sonia Lopes da Silva. Rio de Janeiro, março de 2016. Available at: https://bs.sede.embrapa.br/2015/relatorios/solos_2015_barragem-subterranea.pdf

if their land is to be coveted by farmers in the region. Thus, if the project does not consider the specific support to such communities, as well as their inputs to the project implementation, there may be an impact on the community.

3. Erosion processes induction and soil impoverishment: Some regions in the semiarid are naturally prone to erosive processes and mass movements. Currently, most farmers make use of poor soil management practices and suppression of vegetation that can cause loss of fertile soil. The use of inadequate vegetation suppression techniques, such as land clearing using slash and burn, can contribute to worsening soil conditions. The objective of implementing the CRPS is to change these practices, however, this can take more time than expected by the project. In addition, during implementation of component 2 investments, erosion and soil compaction can happen around the sites where water storage systems will be constructed, with loss of soil structural and biotic properties. Thus, the construction activities and implementation of CRPS can aggravate the erosive process by leaving soils devoid of vegetation cover, being subject action of rains and to the superficial drainage of the rainwater and, with this, the transport of superficial material.
4. Contamination of water resources and soil: The inappropriate use of fertilizer, irrigation, construction materials and soil transportation can contaminate neighbouring water resources and soil.
5. Interferences with vegetation: During the initial phase of implementation of the CRPS, there may be suppression of remnants of vegetation of the caatinga, although that will be strongly discouraged by the TA team of the project. Reducing vegetation fragments can lead to habitat fragmentation, which can lead to loss of habitat and species, contributing to the impact on biodiversity and climate. Once the CRPS are in place there should be more vegetation, and consequently an increase in biodiversity.
6. Interference with protected areas: Some Indigenous and many family farmers and traditional communities don't have land tenure. Especially Quilombolas and Fundo de Pasto communities don't have properly demarcated land rights, and some may reside in protected areas. Some family farmers and traditional communities are not aware of the environmental legislation and may suppress vegetation in areas protected by law, such as Permanent Protected Areas (APPs) and legal reserves. Because of the drought conditions in the Northeast, most of the plantations are located close to water bodies, which are Permanent Protected Areas (APPs). It should be noted that, the areas chosen for project implementation may be located in buffer zones of environmental preservation, since the sustainable agricultural activities proposed will contribute to preservation of environmentally sensitive areas and natural habitats.
7. Increased scarcity of water resources: In general, family farming in the northeast does not use irrigation (sequeiro). This project will introduce irrigation techniques to many families to reduce their vulnerability to climate change. The project's irrigation will be coupled with rainwater capture and storage systems. However, neighbours and other farmers (non-beneficiaries) may want to simulate the success of the beneficiary farmers and use less sustainable sources of water for irrigation. This could further hinder water security in a region with already scarce resources.
8. Increase in salt content of the soil: A subcomponent of the project will promote productive activities with effluents from 24 existing desalinisation units (there are over 500 in the region), such as fish breeding, quenching animal thirst and irrigation of salt resistant plant varieties for animal feed. Currently, these effluents are contained in open pits with no utilization. Under certain conditions (with wells with sufficient flow, with salt content below the highest levels), it is possible to develop a productive and intensive use of the concentrate. The effluents salt concentration depends on that of the original well, and can be from 20-40% higher. The project will implement bioassaline productive units to test their effectiveness, environmental impact and income generation potential. Salt can accumulate in these small lots (1 hectare) and contaminate neighbouring units in the rainy season through runoff.

9. Gender discrimination: Exclusion of female agricultural workers from technical, production-oriented activities can occur by TA services that are devoid of gender-transformational approaches.
10. Impact on the health and safety of farmers: Poor labour conditions and workers safety not complying with international standards for construction of eco-efficient stoves, biodigestors, water capture and treatment systems, and can cause health related complications, and the increase the risk of injuries.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

It is at the core of the project's theory of change to address vulnerabilities of family farming systems and build resilience capacities of smallholder vulnerable farming families in the NEB. As such all the PCRP investments are directly focused at 'doing-good' and the achievement of resilience capacities will be monitored through the family resilience scorecard and index presented in Appendix 1 to Annex 11 Monitoring and Evaluation Plan. Nevertheless, while doing so some of the activities might create some adverse environmental and social risks, as identified in the previous section, which need to be mitigated to avoid doing any nonintentional harm. The below table is the preliminary ESMP and identifies: risk types and related potential negative impacts which might occur because of project interventions; the related project mitigation measures; the responsible entity for their implementation; and the related budget.

The ESMP will be revisited and finalized at project start-up as part of the Project's Implementation Manual (PIM).

Table 3 Preliminary Environmental and Social Management Plan

Risk Type	Potential negative impacts	Project Mitigation Measures	Monitoring	Responsible institution	Costs ¹¹⁰ (USD)
Social risks and mitigation measures					
Land tenure security	Many family farmers and indigenous, quilombolas and Fundo Pasto communities and other family farmers do not have tenure security to their lands, which makes them vulnerable to encroachment from other actors and reduce their incentives to invest in CRPS and conservation measures. The project's investment in land improvements may increase pressure from encroachment	<p>The participatory mapping and planning exercise, as part of the development of the TRIPs, will include conflict mediation and resolution over the use of resources (activity 1.1.1)</p> <p>The project will provide legal and notary support to project's beneficiary communities for the registration of their land (activity 1.1.4).</p> <p>Interested communities or individual beneficiaries will be supported in obtaining a CAR. (activity 1.1.4)</p>	<p>M&E tracking of TRIPs. Including, legal and notary support, conflict mediation, CAR support.</p> <p>Quarterly Project Management Accountability System (PMEL) reports.</p>	SIUs and PMEL delivery organization.	<p>5,000 / TRIP % of activity 1.1.1-1.1.4; <u>estimated per investment, not on yearly basis.</u></p> <p>Tracking of support included in M&E budget.</p>

¹¹⁰ All figures consider estimates based on total project cost and projected beneficiaries; must be adjusted for state level sub-projects. Costs are presented per year unless otherwise stipulated.

Indigenous and traditional communities' right to self-determination	Even though indigenous and traditional communities are extremely vulnerable to poverty and climate change and are among the targeted beneficiaries, they might reject project activities and support due to poor information and consultation processes	Once the project area is selected, an Indigenous Peoples Planning Framework (IPPF) will be implemented and approval will be sought from FUNAI to ensure agreement on the FPIC process. The communication activities proposed in Component 3 will provide all communities with qualified information about the objectives, scope, criteria and policy of the project. A consultation process with each community will be implemented where the communities will decide on how they want the project activities to proceed in their lands based on their documented consent. This will be followed by the participatory development and consent on the TRIPs which will be the basis for project investments and technical support in component 1 and 2.	TRIPS FPIC tracking through PMEL system. Quarterly (PMEL) reports.	SIUs and PMEL delivery organization.	Activity 3.1 (%): 17,000 / sub-project Tracking of FPIC included in M&E budget.
Gender based discrimination	Women are not participating in project activities and do not access the benefits.	The project has a Gender Assessment and Action Plan that is mainstreamed in project activities and is an important complement to the ESMP. Some key actions are: All project personnel will have training in gender-transformational approaches and avoidance of gender biases and discrimination Direct targeting strategies will be applied and their effectiveness monitored for the inclusion of women 40% of technical assistance team will be women. Specific training for women on CRPS technologies and practices and	Quarterly collecting gender disaggregated monitoring and evaluation data to track the extent to which women have been able to participate and benefit from project activities and take leading roles and positions. Tracking of procurement processes for gender activities.	SIUs and PMEL delivery organization.	% of SIU: 12,000 / sub-project 27 training events: USD 123,238. % of activity 3.1. Gender disaggregated tracking included in M&E budget.

		<p>encouragement and support to women in becoming farmers-trainers</p> <p>Implementation of productive activities with women focused on the cultivation of nutritionally-rich foods in backyard gardens and other productive spaces, including native, rustic edible plants that are more resilient in semiarid conditions</p> <p>Promotion of seed banks” operated by women as a mechanism for validating the native knowledge of heirloom seeds, involving women directly in such efforts.</p>			
Exclusion of youth	Young people are not participating in project activities and do not access the benefits, making them more prone to unqualified migration.	<p>Specific strategies will be implemented to encourage youth participation in the development and implementation of the TRIPs such as the use of youth focus group discussions to capture their ideas and aspirations to be included in the TRIPs</p> <p>Youth rural educational institutions will be supported in developing and implementing curricula for teaching and experimenting with CRPS.</p> <p>Youth will be involved in young communicators networks being trained in and responsible for facilitating production of audiovisual and printed materials to support CRPS and development of a participatory audiovisual monitoring model all in close collaboration with TA teams and community-based partner organizations</p> <p>Youth will also be involved in short-term professional courses in CRPS and will subsequently be incorporated in TA teams and serve as liaisons with families</p>	Quarterly collecting youth disaggregated monitoring and evaluation data to track the extent to which youth have been able to participate and benefit from project activities and take leading roles and positions.	SIUs and PMEL delivery organization.	<p>% of SIU: 12,000 / sub-project</p> <p>Youth disaggregated tracking included in M&E budget.</p>

		Finally, youth will also be an important part of the target group for the small grant support for micro enterprises and entrepreneurship in businesses that support the upscaling of CRPS			
Labour's rights and working conditions	Most works will be done through farmer's and community groups, However in the case contractors will be used for water works, there can be a risk of non-compliance with labour rights and conditions.	In case any contractors will be used a specific clause on labour rights and conditions and compliance with national and state labour laws will be included in the contract and compliance will be periodically monitored.	Tracking and verification of procurement process.	SIU procurement specialist.	% of SIU: 2,000
Nutrition security	The increase and diversification of agricultural production will not translate into improved diets of family farmers.	The project will integrate nutrition education modules in the technical assistance trainings delivered by service providers. Nutrition education will be also included in schools where CRPS will be implemented.	M&E tracking of CRPS.	SIUs and delivery organizations.	% of SIU: 2,000
Farmers' and family members health	Farmer's health may be affected from inadequate use of pesticides following increase in crop cultivation facilitated by increased access to water. Family health may be impacted from the reuse of household waste water for vegetable production if the water is not adequately treated	The project will only promote no-pesticide farming practices including a range of integrated tools for plant protection taking into account climate change effects on pest and diseases. As part of trainings and discussions with farmers and communities' awareness raising and information will be provided on health and environmental risks linked to the use of pesticides and safe-use practices. The technologies to be used for the reuse of treated household waste water for vegetable gardening (grey water) and fruit trees and non-eatable plants (black water) has already been implemented and proven to be safe. The grey water is filtered through physical and biological mechanism and the black	Annually monitoring of compliance with environmental and social safeguards including all mitigation measures included in the business plans and financing agreements	SIU safeguard specialists.	% of SIU: 8,500 / sub - project Tracking of ESMP included in M&E budget.

		<p>water is cleaned through an evapotranspiration tank (green septic tank).</p> <p>The latter technology not only facilitates recycling of water and nutrients but also address the significant gap in access to proper sanitation for rural households. As such they contribute significantly to sanitary improvement of environmental and living conditions of beneficiary families. The quality of the water after the cleaning will be systematically monitored.</p>			
Environmental risks and mitigation measures					
Contamination of water resources and soil	Water and soil may suffer contamination from inadequate use of agrochemicals following increase in crop cultivation facilitated by increased access to water.	<p>All beneficiaries will have support from TA teams throughout the project implementation including for CRPS (component 1) and construction and management of water infrastructure and technologies (Component 2).</p> <p>In addition to the activities to avoid the use of pesticides and raise the awareness on their associated health and environmental risks, the project will promote practices to minimize or eliminate the use of fertilizers. As such CRP will promote nutrient recycling techniques from vegetation, compost and manure and the use of green and organic fertilizers.</p> <p>Before designing a CRPS for the individual farmers, famers will be supported in analyzing the specific history of the soils, the climate, the pests found in the region, and the crop of a certain field. No pesticides will be purchased with project's resources.</p>	<p>Annual monitoring of compliance with environmental and social safeguards including all mitigation measures included in the business plans and financing agreements.</p> <p>Tracking of TRIPS and procurement of TA.</p>	SIUs and PMEL delivery organization.	<p>% of TA: 15,000 / TRIP. <u>Estimated per investment, not on yearly basis.</u></p> <p>% of SIU: 8,500 / sub - project</p> <p>Tracking of ESMP included in M&E budget.</p>

Increase in soil salinity	The project will promote productive activities with effluents from 24 existing desalinization units. Salt can accumulate in these small lots and contaminate neighboring units in the rainy season through runoff.	The soil in the neighboring units to the 24 pilot areas (each of 1 hectare) will be monitored by Embrapa and the Fresh Water Program to ensure salt concentrations are at acceptable levels.	Regular monitoring of interventions.	Embrapa, SIU	% of Activity 1.1.3: 40,000
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As presented in annex 11 of the Funding Proposal, a Planning, Monitoring Evaluation and Learning System (PMEL) will be developed as part of component 3 to allow the results-based project management. The data and information collected through the use of specific tools for the implementation of Climate Resilience Productive Systems (CRPS), will contribute not only to learning, feedback and improvement of project interventions but will also build the foundations for the material relevant to the knowledge management. The PMEL will be a fundamental source of information to the Central Project Management Unit (CPMU/BNDES) decision making and will be in particular useful to provide feedback to the State level implementing unit(SIUs) at the state level.. Each State will carry out the physical and financial monitoring of the implemented activities using the DATA-FIDA system and will report to the CPMU to monitor the implementation of the project as a whole. The system has been developed by *Programa Semear Internacional* and all projects in Brazil use it to organize information so that it reflects the implemented activities contribution both to the logical framework. IFAD will be responsible for supervising project implementation, verifying results and recommending adjustive measures if targets are not being met.

9. STAKEHOLDER CONSULTATIONS

In the second half of 2018, a team of nine consultants from various areas of expertise were hired by IFAD and joined the BNDES team to prepare the proposal presented. This process of elaboration was guided by subsidies derived from the empirical reality, captured from field visits to communities in the semiarid region of the Northeast States and through meetings and public consultations with potential stakeholders, both governmental and non-governmental organizations.

During field visits to the semiarid states of Bahia and Pernambuco in October 2018, the team testified demonstrative experiences developed by family farmers, many of which focused on environmental sustainability, such as agroforestry systems (SAFs). Most of these projects were developed with the support and advice of non-governmental organization, such as Centro Sabiá and Caatinga (in the case of the state of Pernambuco), which have the purpose of promoting a series of actions anchored in integrated processes of water management, agroecology, food security and ecosystem conservation. The novelty of the dialogues with these possible partner organizations was the introduction of issues inherent to the environmental field so they could be brought to reflect on the contributions of their actions to processes of adaptation and mitigation of climate change at the local and regional levels. Also, it was an essential step for the team of experts, an opportunity to perceive the gaps in the experiences presented and point out possible fragilities and risks. During these field missions, there were meetings not only with the beneficiaries of socio-environmental actions (construction of technologies for water collection and storage, and agroecological practices) but also with potential stakeholders that already implement strategies for preserving ecosystems and natural resources. These engagements were crucial for outlining the Project and establishing a network of contacts with stakeholders that can be potential Project partners.

At the end of October 2018, this team held a series of meetings with Federal Government institutions in Brasília, such as the Secretariat of Family Agriculture and Agrarian Development (SEAD), the Ministry of Social Development (MDS) - actual Ministry of Citizenship (MC), the Ministry of the Environment (MMA), the Secretariat of International Affairs (SAIN), the Ministry of Science, Technology, Innovation and Communications (MCTIC), and the General Coordination of Policies for Women, Youth, Peoples and Traditional Communities (CEGAT). These meetings were fundamental to understand the contributions of these actors for each component of the Project and its institutional arrangements, being a basis for the construction of a Stakeholder Plan that considers the complementarities between governmental and non-governmental organizations in implementation strategies.

Two public consultations were also carried out during this preparatory phase. They were essential steps both to re-dimension some aspects of the Project (e.g., intervention strategies, guiding concepts and the relationship between the components) and to mobilize potential stakeholders around the proposed project. The description and results of both consultations:

- (i) The first public consultation was held in Recife on October 18, 2018, with more than 100 participants, representing around 32 entities. The event focused on the discussion of themes that underpin the main axes of the Project and its main strategies, so that people could contribute to Project designing and express their main concerns and considerations. Thus, the organizations present were divided into the following groups: (i) Adaptation Measures; (ii) Mitigation Measures; (iii) Agroforestry: SAF principles in the Semi-Arid; (iv) Youth, traditional communities and gender; (v) Technical assistance; (vi) Biosaline Agriculture. Each group produced a series of propositions from its thematic axis and presented the issues in the Plenary, generating debates. Some points that crossed all groups were reported in the final synthesis, such as the importance of experimentation and of exchange among actors involved to promote the agroecological principles. The themes of political incidence and "scaling up" successful experiences were also emphasized.
- (ii) The second public consultation was with a specific segment that assumes a central role within the Project's targeting strategy: indigenous peoples. It was held on May 9, 2019, in Salvador, with a total of 110 people, representing the following ethnicities of the states of Bahia: Pataxó, Tubanambá, Pataxó hãhãhãe, Atikum, Kiriri, Kaimbé, Tapuia, Tumbalá, Kantaruré. The following organizations and institutions that support

indigenous rights were also present at the consultation: APIB Articulation of the Indigenous Peoples of Brazil (APIB); Articulation of Indigenous Peoples and Organizations of NE, MG and ES (Apoime); Indigenous Movement of Bahia (Miba); Indigenous Missionary Council (Cimi); Bahia Indigenous Education Forum (Forumeiba); Association of indigenous teachers of the North and West of Bahia (Apinoba).

This consultation had two objectives: (i) to take into account the specific contributions of indigenous peoples in this Project, respecting their specificities; (ii) identify possible risks in the implementation cycle, related to particular needs of indigenous peoples. The consultation was guided by the concept of FPIC (Free, Prior and Informed Consent), which constitutes an effort to "guarantee to an affected or traditional community (local communities within the area of influence of the Project) the right to give or not their consent to projects that may affect their lands, understood as those they habitually occupy or use". This Project, focused on socio-environmental sustainability measures for facing climate change, understands that indigenous peoples of Brazil contribute significantly and play a crucial role in the reduction of deforestation, ecosystem preservation and efficient management of natural resources in the national territory. At the same time, there are risks in the implementation of any project since indigenous villages are governed by other patterns of behavior, interpersonal and power relationships.

Some of the points raised in the plenary by the participants deserve prominence and have been taken into account in the design process:

- (i) The importance of valuing differentiated modes of production of indigenous peoples: Participants from different tribes raised their tendency to produce collectively within a given area. According to a leader of the Atikum ethnic group, "they prioritize working collectively because they produce more." This issue needs to be taken into account in the Technical Assistance services.
- (ii) The productive processes have been directed towards self-consumption, but there is interest in investing more in income generation initiatives. The representatives of this Consultation emphasized that the notion of environmental preservation is not a hostile force, which comes as a shock to income generation. These are strengths that can be added in work aimed at improving agricultural activities.
- (iii) Indigenous peoples emphasized the importance of "producing without pesticides" and expressed interest in deepening knowledge about ways to "generate income without pesticides".
- (iv) In the case of some peoples, such as Kiriri, there is a concern with the plantation of monocultures, such as Eucalyptus, which has aggravated the process of deforestation in the area around the villages.
- (v) Regarding the possible risks, some representatives warned of the need to consult the cacique about the process of implementation of the Project, since he assumes a position of authority in the indigenous villages. There should be respect for the organizational forms of indigenous peoples, which entails careful consultation with the cacique and village management bodies, such as the "Council" composed of older people.
- (vi) Regarding the procedures indicated, the representatives pointed out the importance of conducting a "pre-diagnosis" in the areas to be affected in each community. They emphasized the ways of "reaching the territory", clarifying that "it has to reach the Territory with a differentiated look."

Bahia, state that was chosen for the conduction of the consultation, became a "sample" of the issues that affect multiple indigenous peoples in their various territories. The proposals raised were incorporated into the design of the Project and should guide other inquiries. The plan is to carry out further consultations with indigenous peoples within the states that will be chosen to integrate the Project during its implementation cycle. These consultations will be guided by the objective of creating an agreement with such communities, based on the notion of free, prior and informed consent. It demonstrates a commitment on the part of the executing agencies to engage in the construction of a space that provides direct interaction with the various segments that make up the target audience. It is important that the demands of these distinct social groups be considered at the beginning of the Project's implementation so that adjustments can be made promptly.

Annex 7 presents the detailed and comprehensive "Stakeholder Engagement Plan" of this funding proposal, including continuous engagement plan.

10. GRIEVANCE AND REDRESS MECHANISM

IFADs Grievance Redress Mechanism can be accessed when necessary to manage project-related grievances that cannot be resolved by the project's Executing Entity. IFAD Complaints Procedure for alleged non-compliance with its social and environmental policies and mandatory aspects of its Social, Environmental and Climate Assessment Procedures (SECAP).

IFAD-funded projects and programmes are designed in a participatory manner, taking into account the concerns of all stakeholders. IFAD requires that projects are carried out in compliance with its policies, standards and safeguards. Moreover, IFAD's Strategic Framework calls for ensuring that projects and programmes promote the sustainable use of natural resources, build resilience to climate change and are based upon ownership by rural women and men themselves in order to achieve sustainability.

The objective of the IFAD Complaints Procedure is to ensure that appropriate mechanisms are in place to allow individuals and communities to contact IFAD directly and file a complaint if they believe they are or might be adversely affected by an IFAD-funded project/programme not complying with IFAD's Social and Environmental Policies and mandatory aspects of SECAP.

Complaints must concern environmental, social and climate issues only and should not be accusations of fraudulent or corrupt activities in relation to project implementation – these are dealt with by IFAD's Office of Audit and Oversight.

10.1.1 Principles of engagement

The channels of engagement adhere to the process of communication with the different stakeholders, which rely on:

- Quality of service: handling the requests and complaints from respondents with proper quality of service.
- Free and Impartial service: respect for the diversity of different publics, with the commitment to exercise activities impartially, without favour of any order, free of prejudice and any fraud, corruption or practice of actions harmful to national and international public administrations.
- Right to Information: guaranteed right to access information, in transparent, clear and accessible language, in accordance with the law.
- Channel of dialogue: maintain an open channel of dialogue with the news media, social networks, and various other social sectors.
- Good faith and willingness to resolve the conflict, grievance, complaint or dispute should be considered as an essential pre-requisite to the process;
- A mediator may be mutually agreed to assist with resolving the conflict and/or grievance;
- The decision/resolution arrived through mutual agreement should be considered as final;
- Such decision would be signed by both parties and witnessed and communicated as the final and binding decision – at whichever level a decision or resolution of conflict or grievance is agreed.

10.1.2 Eligibility criteria

To file a complaint for alleged non-compliance with IFAD's social and environmental policies and mandatory aspects of its SECAP, IFAD will consider only complaints meeting the following criteria:

- The complainants claim that IFAD has failed to apply its social and environmental policies and/or the mandatory provisions set out in SECAP.
- The complainants claim that they have been or will be adversely affected by IFAD's failure to apply these policies.
- Complaints must be put forward by at least two people who are both nationals of the country concerned and/or living in the project area. Complaints from foreign locations or anonymous complaints will not be taken into account.
- Complaints must concern projects/programmes currently under design or implementation. Complaints concerning closed projects, or those that are more than 95 per cent disbursed, will not be considered.

10.1.3 The process

The complainants should first bring the matter to the attention of the government or non-governmental organisation responsible for planning or executing the project or programme (the Lead Agency), or to any governmental body with the responsibility for overseeing the Lead Agency. If the Lead Agency does not adequately respond, then the matter may be brought to the attention of IFAD. The issue may be brought straight to IFAD if the complainants feel they might be subject to retaliation if they went to the Lead Agency directly.

The Regional Division will examine the complaint and, if necessary, will contact the Lead Agency, or the governmental body with the responsibility for overseeing the Lead Agency, to decide if the complaints are justified. If the complainants request that their identities be protected, IFAD will not disclose this information to the Lead Agency or anyone else in government.

If the complaint is not justified, the Regional Division will inform the complainants in writing.

If the Regional Division finds the complaint is justified and there is proof of actual or likely harm through IFAD's failure to follow its policies and procedures, IFAD will take action. This may consist of making changes to the project/programme, or requiring that the EE observes its obligations under the Financing Agreement. IFAD's response will focus bringing the project/programme into compliance and no monetary damages will be available or paid in response to such complaints. The complainants will be informed of the outcome of the issue by the Regional Division.

In all cases, if the complainants disagree with IFAD's response, they may submit a request to SECAPcomplaints@ifad.org and request that an impartial review be carried out by the Office of the Vice-President.

The Office of the Vice-President will decide on the steps to be taken to examine such complaints, including, if necessary, contracting external experts to review the matter. The complainants will be informed of the results of the review.

IFAD will include in its Annual Report a list of received complaints and a summary of actions taken to address them.

10.1.4 How to submit a complaint

A complaint relating to non-compliance with IFAD's Social and Environmental Policies and mandatory aspects of its SECAP can be submitted in any of the following ways:

- Download the complaints form (Word) available [here](#) and as appendix 3 of this document.
- Send an email to SECAPcomplaints@ifad.org or mail to:

IFAD

SECAP Complaints (PMD)

Via Paolo di Dono 44

00142 Rome, Italy

Complaints must include the following information:

- Name, address, telephone number and other contact information
- Whether the complainants wish to keep their identity confidential, and if so, why
- Name, location, and nature of the IFAD project/programme (if known)
- How the Complainants believe they have been, or are likely to be, adversely affected by the IFAD-supported project or programme

10.1.5 The project-level Grievance Redress Mechanism

The project will establish one or more grievance mechanisms at field level to file complaints. Contact information and information on the process to file a complaint will be disclosed in all meetings, workshops and other related events throughout the life of the project. The project will include in the capacity building program information on the GRM and will organize consultations to determine the most suitable way for beneficiaries and stakeholders to communicate their concerns and ideas.

The Grievance Redress Mechanism and guidelines will be developed for the project taking into account IFADs corporate Complaints Procedure to receive and facilitate resolution of concerns and complaints with respect to alleged non-compliance of its environmental and social policies and the mandatory aspects of its Social, Environmental and Climate Assessment Procedures.

The project will also be responsible for documenting and reporting as part of the safeguards performance monitoring on any grievances received and how they were addressed.

10.1.6 How to submit a complaint at project level

Complaints can be raised either orally or in writing, directly to the State level implementing unit (SIU); the SIU will be responsible for creating and notifying of a digital and physical address to which complaints can be addressed.

Complaints must include the following information:

- Name, address, telephone number and other contact information
- Whether the complainants wish to keep their identity confidential, and if so, why
 - All necessary provisions will be taken to keep complainants' identities confidential in the complaints procedure when so requested.
- Name, location, and nature of the IFAD project/programme (if known)
- How the Complainants believe they have been, or are likely to be, adversely affected by the IFAD-supported project or programme

10.1.7 The process at local level

Submitted complaints will be sent to the Project Manager and M&E officer to assess whether the complaint is eligible. Project Manager will inform and incorporate the relevant Senior Safeguards specialist, social and/or environmental, as required.

Eligible complaints will be addressed by the SIU. The PM and relevant Senior Safeguards Specialist, with support from the M&E Officer will be responsible for recording the grievance and how it has been addressed if a resolution was agreed.

If the situation is too complex, or the complainer does not accept the resolution, the complaint must be sent to a higher level, until a solution or acceptance is reached:

- 1st level: At this level, received complaints will be registered, investigated and solved by the SIU.
- 2nd level: If the complaint has not been solved and could not be solved in level 1, the SIU must report it to the CPMU. Received complaints will be registered, investigated and solved by the CPMU.
- 3rd level: If the complaint has not been solved and could not be solved in level 2, the complaint must be submitted to IFAD following the procedure stipulated above.

Notwithstanding the above, all complaints may be directly submitted to BNDES (2nd level) where applicable stipulations in the Brazilian norms and in the BNDES ombudsman's office will prevail. The GCF independent Redress Mechanism and the Secretariat's indigenous peoples focal point will be available for assistance at any stage, including before a claim has been made.¹¹¹

For every complaint received, a written proof will be sent within ten (10) working days; afterwards, a resolution proposal will be made within thirty (30) working days.

In compliance with the resolution, the person in charge of dealing with the complaint, may interact with the complainant, or may call for interviews and meetings, to better understand the reasons.

All complaint received, its response and resolutions, must be duly registered.

10.1.8 Resolution

Upon acceptance of a solution by the complainer, a document with the agreement should be signed .

10.1.9 Other considerations

Certain measures will most definitely favor the efficiency of the Grievance Redress Process within the context of PCRP. The first of these measures is the creation of mechanisms and procedures that promote Stakeholder groups' engagement in the Project's strategic actions, such as the implementation of management bodies that incorporate multiple stakeholders at both the CPMU and State-level Implementing Units (SIUs) levels. At the SIU level, consultative councils will be created to ensure that PCRP's objectives and strategies are met, with a deep commitment to principles of transparency and equity, through the full participation of the beneficiaries, state secretaries and representatives from civil society partner organizations. In order to guarantee that the most vulnerable stakeholder groups will be well represented in these representative spaces and bodies, rigorous selection criteria will be strictly followed. Their active participation will also be stimulated through the following measures: (i) Inputs of stakeholders will be considered in the construction of Baseline studies during the first year of the Project's implementation cycle; (ii) A crosscutting approach to gender, race and ethnic aspects will be incorporated in Territorial Resilience Investment Plans, as well as in other strategies and methodological instruments, with the guidance and orientation of Youth, Gender and Traditional Communities Specialists; (iii) Consultations with traditional communities will take place so as to guarantee free, prior, and informed consent; and (iii) periodic evaluations will be prioritized, based on a review of potential social and environmental risks and strategy-planning for overcoming such obstacles.

All Professionals that act on local and regional levels within the scope of PCRP must be aware of the principles contained in the SECAP and IPPF – Indigenous Peoples Planning Framework and how they influence their intervention strategies. For instance, all technical assistance professionals that act directly in the field should be

¹¹¹ Information available at: <https://irm.greenclimate.fund/home>

aware of project ESMP and specifically that a consultation process should be undertaken to solicit and obtain indigenous peoples' free, prior and informed consent (FPIC) before any action is taken in indigenous peoples' communities and /or if there exists the possibility that proposed interventions might directly affect indigenous peoples' communities and their rights. The principles of this IPPF, which is line with the Green Climate Fund's Indigenous People Policy and the IFAD Policy of Engagement with Indigenous People, should be clearly laid out in Training sessions in the first 6 months of PCRPP's implementation cycle. Measures such as these represent forms of assuring good performance standards within the Project, in such a way that complaints and grievances, although they are inherent to any social process, are dealt with in due time and do not necessarily need to be taken forward within formal mechanisms and procedures. In consideration of the power dynamics that tend to place indigenous communities in a situation of disadvantage in relation to other social groups and institutions, as well as the history of violence, which has plagued indigenous and other traditional communities (ex: "Fundos de pasto"; quilombolas), especially in the face of social and environmental conflicts concerning the use of land and natural resources in many of these territories, when a claim is presented by IPs, the complainants' identities should be kept confidential at all costs in these procedures.

In evaluation and monitoring sessions, that will take place every 6 months, focus groups will be formed so as to facilitate the expression of opinions by specific segments (ex: women x men; youth x elders) about different aspects of the Project's implementation process (activities planned, environmental and social risks, etc.) The evaluation and monitoring of Project strategies and actions should take place on an ongoing basis, as risks and impacts arise, and should be free from any sort of interference, coercion or intimidation on the part of Project team members or other third parties. Creating designated spaces for evaluation processes that allows for the voices of disadvantaged groups to be heard is a necessary measure for safeguarding their possible concerns, in such a way that they do not necessarily become formal complaints and grievances. In the case of rural women, for instance, who tend to suffer from situations of violence or other forms of violations in the family units or in community instances, such focus groups are an efficient strategy for creating a safe space in which such issues can be raised and dealt with in a proper manner. Gender specialists, who act on all levels of the Project, will also be important mediators of such complex situations, guaranteeing at all times the upmost confidentiality and protection of possible victims.

It is important to clarify that accessing a grievance mechanism should represent the last resort, given that constant dialogue between these most vulnerable social groups and Professionals trained to consider such demands and mediate conflicts, such as the Youth, Gender and traditional communities Specialists, will be cultivated through the Stakeholder Engagement strategy (see Annex 7 for greater details). This strategy can be seen to be an act of prevention – so that concerns can be channeled and expressed in due time and don't necessarily need to move on to the next level, becoming full-fledged grievances.

Once an identified problem turns into a formal grievance and is taken to the Project-level mechanism, it is important that vulnerable stakeholders understand that their legal rights will be protected under a national judicial process. Also, it should be made clear to them that, if they are not satisfied with the resolution that has been provided by the Project-level local mechanisms, another option involving mediation through conflict resolution exists. This possibility should be widely disseminated in all explanations given about the GRM and its forms and stages of operation during the process of fortifying Stakeholders and their engagement in the Project as a whole, as well as once any complaints are registered. In the case of indigenous people, this option may be considered to be more culturally appropriate, given their different conceptions of adequate processes for mediating conflicts and finding collective solutions within the context of PCRPP's interventions. The mediator to be chosen in such cases should be a person who has credibility in the context of indigenous communities and who displays understanding of their cultural specificities. Strict criteria concerning the profile and experience of this professional should be reviewed and validated by Consultative Councils at the SIU level, as well as other governing instances.

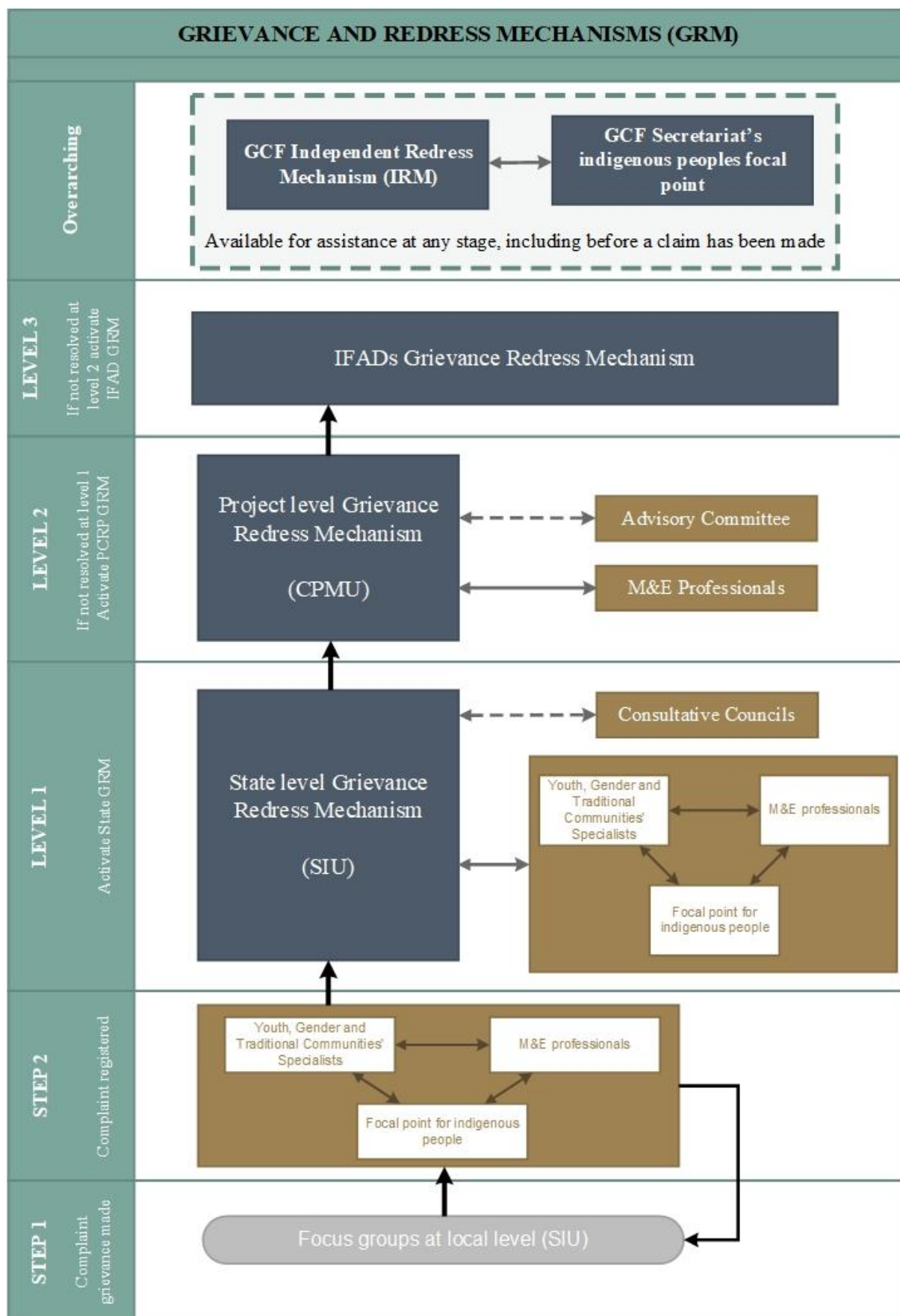


Figure 11 Grievance Mechanisms and process

11. SEXUAL HARASSMENT, SEXUAL EXPLOITATION AND ABUSE

In line with IFAD's policy to preventing and responding to sexual harassment, sexual exploitation and abuse (2018)¹¹², all contracts with project staff, contractors, suppliers and other third parties to be funded with IFAD funds will include: (i) provisions prohibiting acts of sexual harassment and SEA, (ii) provisions establishing an obligation to immediately report to IFAD or the Government incidents of sexual harassment and/or SEA in IFAD-funded or -managed activities or operations, and (iii) provisions allowing for the immediate termination of contract based on proven acts of sexual harassment and/or SEA in connection with IFAD-funded or -managed activities or operations.

The appropriate reporting channel for sexual harassment and SEA is the Ethics Office (Hotline +39 06 5459 2525 or ethicsoffice@ifad.org). SEA allegations can also be reported to the Office of Audit and Oversight (Hotline +39 06 5459 2888 or anticorruption@ifad.org). IFAD is also putting in place regional SEA focal points.

The existence of the Grievance and Redress mechanism, the complaint process, as well as the mandatory compliance with IFAD policies including SEA, must be communicated to the organizations and beneficiaries of the project by the executing unit.

12. DISCLOSURE

The project will disclose the relevant documentation developed through GCF design process (including the SECAP and the Gender Assessment and Action Plan) in a timely manner. Category B projects will be disclosed as minimum 30 days before expected date of GCF approval pursuant to the requirements of the GCF Information Disclosure Policy. State-level subprojects will disclose all relevant documentation as minimum 30 days before expected date of BNDES approval.

Disclosed documents must be presented in a way that is accessible and culturally appropriate, placing due attention to the specific needs of community groups which may be affected by project implementation (such as literacy, gender, differences in language or accessibility of technical information or connectivity).

IFAD and the project will ensure the widest dissemination and disclosure of project information possible. Taking into account special needs and limited access to web content; in this regard, special attention will be placed on potential project participants: farmers, illiterate or technological illiterate people, people with hearing or visual disabilities, people with limited or no access to internet and other groups with special needs. The dissemination of information among these groups will be carried out by BNDES and the State partners. All accessible and locally available tools for disclosure will be utilized, including social media, local newspapers, flyers, brochures, radio, and television. Special attention will be placed on dissemination of project environmental and social safeguards, including the Grievance Redress Mechanism.

¹¹² Policy available at: <https://www.ifad.org/en/document-detail/asset/40738506>

13. SAFEGUARDS BUDGET ALLOCATION

The components of the PCRPs require a central and also a decentralized organization to cover the whole set of activities that need to be implemented on the ground as well as to have a fluid communication with IFAD and the BNDES as implementing agency. To that end a Central Project Management Unit (CPMU) will be placed within BNDES and will monitor implementation, compile physical and financial information, report to IFAD and will be overall accountable. Also, each state will establish its own state-level State level implementing unit (SIU), which will be responsible for procurement, financial management, evaluation and monitoring of its own activities

Safeguard supervision of works will need to be hosted at the CPMU and the SIU to control compliance in both levels, on the ground and at the project level ensuring a correct course of actions. A social safeguard and an environmental safeguard specialist shall provide technical support and timely assistance on the ground attending happenings on a daily basis from the SIU. Similarly, a senior safeguard specialist and a climate change change specialist will work with the inputs provided from the SIU and liaise with IFAD. Also consultants will be needed to support the cross cutting themes of indigenous peoples and gender. The Table below has a ballpark estimation on the cost of the personal fully or partially dedicated to the safeguards implementation.

Table 4 Cost estimate of SECAPs dedicated staff

Staff	Quantity	Cost per month	Work Share	Total / year (in USD)
State Level				
Senior Environmental Safeguards Specialist	3	1600	100%	57,600
Senior Social Safeguards Specialist	3	1600	100%	57,600
Communication and Knowledge Management Specialist	3	1600	15%	8,640
Senior M&E Specialist	3	1600	25%	14,400
M&E Analyst	3	1200	25%	10,800
Field level				
Environmental Safeguards Specialist	9	1300	100%	140,400
Social Safeguards Specialist	9	1200	100%	129,600
Communication and KM Specialist	9	1200	15%	19,440
M&E Specialist	9	1200	25%	32,400
Total				470,880

APPENDIXES

APPENDIX I

Indigenous Peoples Planning Framework

1. Project's context and objectives

1. Overall, the Project aims to reduce the impacts of climate change and increase the resilience of poor rural families living in the Brazilian semi-arid, through transitioning to resilient production systems. The Brazilian semi-arid is located mostly in the Northeast region, occupying approximately 12% of the Brazilian territory and hosting 27 million people (12% of the total population)¹¹³. The Project is expected to contribute to increased climate-resilient sustainable development for 1 million poor and food insecure rural households.

2. With the main objective of reducing the impact of climate change and increasing the resilience of the affected population in the semi-arid region in Northeast Brazil, the Project will promote the integrated management of water, food and related ecosystem processes. The Project will consist of three components: (1) access to safe water resources; (2) transition to climate resilient production, with investment, capacity building and technical assistance for reforestation through agroforestry systems and (3) management, knowledge sharing and monitoring.

3. The Project will be implemented in the most drought affected semi-arid areas of up to three states of the Northeast Region of Brazil, crossing with the potential for CRPS analysis. The participation of the states will be determined based on specific criteria (as per eligibility criteria). In this framework, the Project will target the poorest regions and among those the municipalities and communities more exposed to social and environmental vulnerability, and prioritize women, youth and traditional communities, including indigenous peoples, as its main beneficiary groups¹¹⁴.

2. Rationale for the Indigenous Peoples Planning Framework (IPPF)

4. In line with the Green Climate Fund's Indigenous People Policy and with the IFAD Policy of Engagement with Indigenous Peoples, this IPPF aims to ensure that indigenous peoples' rights are respected and that indigenous peoples' communities are able to actively participate and benefit from the development of project's interventions. With this objective, IFAD, BNDES and the States, will define a consultation process to solicit and obtain indigenous peoples' free, prior and informed consent (FPIC) before any action is taken in indigenous peoples' communities and / or if the proposed interventions might directly affect indigenous peoples' communities and their rights. In this framework, the present IPPF has been designed to ensure that, whenever the Project will operate in areas where indigenous peoples live, they will; (i) be fully and effectively engaged in the design, development and implementation of Project's activities; (ii) receive culturally appropriate social and economic benefits; (iii) not be harmed or suffer from adverse impact that may result from the Project.

5. At the present stage of the Project design process it is still not possible to identify which indigenous peoples' groups and communities will be targeted. This will depend on the geographic coverage of Project's interventions that, at the same time, will depend upon states' participation. In this context, the IPPF aims to provide guidance to the preparation of the Indigenous Peoples' Plans (IPPs) that will be designed, together with indigenous peoples' communities, once the Project area and the indigenous peoples' groups will be identified. The IPPF for the current proposal, therefore, shall be considered a working document that is expected to be iterated and shaped through inputs by the indigenous peoples, their communities and their organizations who will be directly involved in the Project. In other words, it is expected to be a living document that will be adapted and elaborated in tandem with the unfolding phases of the Project.

¹¹³ Ministry of Integration webpage, available at: <http://www.integracao.gov.br/semiarido-brasileiro>

¹¹⁴ On the targeting process and specific criteria that will be employed to select the states and identify/prioritize municipalities and communities, refer on the Targeting section of the main text of the Project proposal.

3. Legal and policy framework for indigenous peoples in Brazil

6. Brazil has a multi-level institutional framework for the promotion and protection of the rights of indigenous peoples and individuals. The mainstay of this framework is the **Federal Constitution of 1988**, which recognizes political, economic and social rights to indigenous peoples, in the respect of their cultural distinctiveness. The Federal Constitution guarantees to indigenous peoples collective rights to "their social organization, customs, languages, creeds and traditions", as well as to "the lands they traditionally occupy"(article 231). Naturally, indigenous individuals also enjoy the same rights as all Brazilian citizens, including the rights to health and education.

7. The leading government institution responsible for the promotion and protection of the rights of indigenous peoples is the Ministry of Justice and Citizenship (MJC) and the **National Foundation for Indigenous Peoples (FUNAI)**. FUNAI works under the Ministry of Justice and Citizenship, according to Law 5,371/1967 and Decree 7,778/2012. Amongst its tasks, FUNAI is responsible to support the identification, demarcation and regularization of Indigenous Lands, to register those territories traditionally occupied by indigenous peoples and to take action against the illegal invasion of indigenous peoples' lands. At the same time, FUNAI promotes policies aimed at indigenous peoples' self-driven and sustainable development, such as the conservation and sustainable management of natural resources in the Indigenous Lands.

8. At the national level, progresses have been made in the last decades to translate the rights of indigenous peoples into **public policies and national programs**:

9. **Health.** In 2010, the Special Secretariat for Indigenous Healthcare (SESAI) was established at the Ministry of Health. Since its creation, the number of professionals dedicated to providing healthcare for indigenous individuals has grown by almost 50%; 45% of the SESAI staff is indigenous. SESAI is also responsible for the provision of sanitation services, including water supply¹¹⁵.

10. **Education.** The National Constitution guarantees the right to bilingual, culturally appropriate basic education to the Brazilian indigenous citizens. The two main permanent forums for discussing and designing policies in this domain are the National Education Council (CNE), and the National Commission for Indigenous School Education (CNEEI). Since 2009, the implementation of indigenous education is led by the Secretariat for Continued Education, Literacy, Diversity and Inclusion of the Ministry of Education (SECADI/MEC), which operates in close co-ordination with State and Municipal authorities.

11. **Environment.** Established in 2007, the National Policy for the Sustainable Development of Traditional Peoples and Communities (PNPCT) seeks to promote the sustainable development of traditional peoples and their communities, including indigenous peoples. One of the main implementation tools of the PNPCT are the Sustainable Development Plans, which aim to inform and guide the implementation of the Policy.

12. In 2012, the Brazilian government launched the National Policy for Environmental and Territorial Management of Indigenous Lands (PNGATI). The Policy calls for the environmental protection and full participation of indigenous peoples in all processes that affect their lands, stressing the need to solicit and obtain indigenous peoples' free, prior and informed consent (FPIC) before taking any actions in indigenous territories. The policy also provides for the participation of representatives of indigenous peoples in institutions in charge of regional and national environmental policies that affect their territories, such as river-basin committees and the Brazilian Climate Change Forum.

13. **International level.** Brazil is an active participant in all key forums and institutions devoted to the promotion and the protection of the rights of indigenous peoples. It is one of the 22 countries that have ratified in 2002 the International Labor Organization (ILO) Convention 169 and supported the adoption of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and the American Declaration on the Rights of Indigenous Peoples (ADRIP). According to these documents, the Brazilian government is required to carry out good-faith consultations with indigenous peoples' representatives in order to solicit and obtain their FPIC, in order to be able to carry out said projects. In 2016 Brazil also ratified the Paris Agreement, which highlights the need to promote and respect the rights of indigenous peoples while addressing climate change-related issues.

115 Source: IFAD, Economic Inclusion Programme for Families and Rural Communities in the Territory of the Plurinational State of Bolivia (ACESSOS).

14. **Current threats.** Despite the achievements reached at the policy level, in the last year violence against indigenous peoples has increased: according to the Missionary Council for Indigenous Peoples, 92 indigenous persons were murdered in 2007; by 2014, that number had increased to 138¹¹⁶. Attacks and killings are frequently reprisals after indigenous peoples reoccupy ancestral lands following long delays in demarcation processes.

15. Today, the demarcation process of indigenous lands is, in fact, stagnating¹¹⁷: this depends on a number of factors, including the debilitation and understaffing of FUNAI, insufficient political will to conclude demarcation procedures at the ministerial and Presidential level, a constant cycle of administrative delays and a general poor understanding of and appreciation for indigenous peoples' distinct ways of life. Furthermore, the urgency for land demarcation is exacerbated by deforestation, destruction of rivers and depletion of soil quality due to intensive monocropping and mining activities, all of which render land and water inadequate for sustaining indigenous peoples' lives. All these factors are exposing indigenous peoples' livelihoods at risk.

16. According to the last report (2016) by the UN Special Rapporteur on the Rights of Indigenous Peoples in Brazil, indigenous peoples reported dire threats to their rights and existence in the context of large-scale or high-impact development projects, including megaprojects such as the construction of hydroelectric dams and infrastructure (being Belo Monte dam one of the emblematic cases that gained international coverage), mining and the laying of transmission lines, that are launched without meaningful consultation to seek their free, prior and informed consent. Furthermore, even where indigenous peoples have demarcated territories, they often lack effective control over their resources owing to increasing invasions associated with illegal activities. Concrete and prioritized actions should be taken to guarantee environmental protection of indigenous lands and their natural resources and to prevent illegal activities, with due consideration to and respect for indigenous peoples' forms of organization and their special relationship with their lands.

4. Background and context: indigenous peoples in the Brazilian Northeast

17. According to the last Brazilian national population census (2010, Institute of Geography and Statistics - IBGE) 896,917 individuals recognize themselves as indigenous, representing 0.47% of the total Brazilian population (Source: IBGE, Brazilian National Census, 2010).

18. There are today 305 indigenous peoples' groups identified in Brazil, speaking 274 languages and dialects: of them, 64% live in rural areas and 36% in urban areas¹¹⁸. The majority of indigenous peoples inhabit the 721 Indigenous Lands located throughout the country (accounting for 13% of the national territory); the highest concentration of Indigenous Lands is found in the Amazon region (*Amazônia Legal*): 422 areas (115,344,393 hectares), accounting for 23% of the Amazon territory and representing 98.25% of the extension of all Indigenous Lands in the country¹¹⁹.

19. The Northeast region is home of a total of 233,079 indigenous individuals (26% of the total indigenous population), representing 80 indigenous peoples' groups. Of this population, 51% are women and 49% are men. The state of Bahia hosts the majority of indigenous peoples of the Northeast (nearly 57,000 people), being the third state in Brazil in number of indigenous peoples, followed by Pernambuco (approximately 53,000 people) (Source: IBGE, Brazilian National Census, 2010). The table below presents the total indigenous population of the Northeast region:

116 Source: (2016) [Report of the UN Special Rapporteur on the rights of indigenous peoples on her mission to Brazil](#), UN General Assembly, Human Rights Council, Thirty-third session, agenda item 3, A/HRC/33/42/Add.1, NY

117 In 2016, there were approximately 20 land demarcations pending Presidential ratification and ministerial declaration. Source: (2016) Report of the UN Special Rapporteur on the Rights of Indigenous Peoples.

118 Source: Instituto Socioambiental. <https://terrasindigenas.org.br/pt-br/brasil>

119 Source: Povos Indígenas no Brasil. https://pib.socioambiental.org/pt/P%C3%A1gina_principal

Table 5 Indigenous population in the Northeast region of Brazil

State	Total population	IPs living in indigenous lands	IPs living outside indigenous lands
Maranhão	38 831	29 621	9 210
Piauí	2 944	-	2 944
Ceará	20 697	2 988	17 709
Rio Grande do Norte	2 597	-	2 597
Paraíba	25 043	18 296	6 747
Pernambuco	60 995	31 836	29 159
Sergipe	340	340	-
Alagoas	16 291	6 268	10 023
Northeast region	233 079	106 482	126 597

Source IBGE, Brazilian National Census, 2010

20. As the table shows, the majority (54%) of the indigenous population in the Northeast region lives outside an Indigenous Land – mostly in communities or agglomerates of villages in rural areas. **Annex 1.** provides a list of the Indigenous Lands located in states of the Northeast region¹²⁰ that might be potentially targeted by the project.

5. IFAD's engagement with indigenous peoples

21. In the past ten years, IFAD has gone a long way in its engagement with indigenous peoples. In line with the agreements adopted at the international level for the recognition of indigenous peoples' rights, IFAD has established institutional instruments and participatory processes to ensure indigenous peoples' full and effective participation in its programmes and projects. In particular:

- In 2009, the Policy on Engagement with Indigenous Peoples was approved by the IFAD Executive Board: the Policy established the principles and instruments for IFAD to engage with indigenous and tribal peoples, and ethnic minorities.
- In this framework, all of IFAD's investments (loans and grants) engaging with indigenous peoples must adopt the free, prior and informed consent as operational principle. FPIC must be sought before any action is taken in areas that are home to indigenous peoples or that might directly affect indigenous peoples' communities. As result of the consultative process, a FPIC Implementation Plan needs to be prepared if the project/programme directly involves indigenous peoples. The Plan includes documentation of the consultation process leading to FPIC of the indigenous peoples' communities and any agreement resulting from the consultation and consent process for the project activities.
- The FPIC principle is also mentioned in the IFAD Policy on Environment and Natural Resource Management (2011) and in IFAD's Social, Environmental and Climate Assessment Procedures (2014, updated in 2017).

22. It is also worth mentioning that IFAD has been the first international financial institution to adopt FPIC as an operational principle in its policy documents. In line the above-mentioned policies and instruments, to date, IFAD has engaged with indigenous peoples in frame of the following operations (loans and grants) in Brazil:

¹²⁰ The list, however, is not comprehensive, since it doesn't include those Indigenous Lands currently under identification and/ or recognition.

Project Name	State/s	Ethnic group/s	State of the project
Dom Helder Câmara Policy Coordination and Dialogue for Reducing Poverty and Inequalities in Semi-arid North-east Brazil	Northeast region (11 states)	Tabajara, Geripankó, Katokim, Karuazu, Aitikun, Xocó	On-going
Sustainable Rural Development Project in the Pernambuco Territories of Zona da Mata and Agreste	Pernambuco	Xucuru	On-going
Maranhão Rural Poverty Alleviation Project	Maranhão	Guajajara, Canela and Krepum - Katayê	Designed. Not yet effective
Kawaip Kayabi Indigenous Association (Grant)	Pará	Kayabi	Closed
Project Pro-Semiárido (PSA)	Bahia	Tumbalá, Kiriri, Tuxá, Kantaruré	On-going
Project “Empowering Indigenous Youth and their communities to defend and promote their food heritage” (partnership with <i>Slow Food</i>)	Bahia	Kiriri	On-going
Project Paulo Freire (PPF)	Ceará	Tabajara	On-going

23. FPIC has been solicited and obtained by the indigenous peoples’ groups involved in projects’ operations and its process was monitored throughout the implementation of projects’ activities through regular communication with indigenous peoples’ representative organizations. To undertake the process of consultation with indigenous peoples, IFAD has strengthened its partnership with FUNAI, at the federal, regional and local level, in the states where IFAD has on-going operations or where new project proposals have been designed. IFAD also has established an on-going relationship with Indigenous rights organizations, many of which directly represent these different ethnic groups, such as the Network of Indigenous People of Brazil (APIB) and the Network of Indigenous People and Organizations of the Northeast Region, Minas Gerais and Espírito Santo (Apoinme). These partnerships will most definitely facilitate the process of consultation with indigenous communities during the development of the current project proposal.

24. In this process of elaborating this project proposal, which has actively engaged a team of 9 specialists from distinct professional areas of expertise since the second semester of 2018, a consultation meeting took place with indigenous peoples’ groups in Bahia in May/2019. This consultation process involved a total of 110 people, representing the following indigenous tribes within the state of Bahia: Pataxó, Tubanambá, Pataxó hãhãhãe, Atikum, Kiriri, Kaimbé, Tapuia, Tumbalá, Kantaruré, as well as organizations and institutions that give direct support to indigenous people within Bahia and nation-wide: APOINME, APIB, CIMI, FORUMEIBA e APINOBA. This experience was especially important because it provided valuable information on crucial aspects of the Project Proposal that directly affect and influence indigenous peoples, as well as aiding in the construction of approaches and methodologies that can be most effective in consultation processes that will take place with indigenous peoples once the Project geographic area is defined and the activities start being implemented.

24. IFAD can also rely upon the experience built in working with indigenous peoples in other countries in the LAC region: in Bolivia, for example, IFAD is specifically addressing climate change adaptation practices with indigenous peoples’ communities by integrating their traditional ecological knowledge into territorial planning and community-based natural resource management¹²¹. By strengthening the sharing of knowledge and experiences among projects, IFAD can foster the scaling up of good practices thus improving project’s outcomes.

121 Source: IFAD, Economic Inclusion Programme for Families and Rural Communities in the Territory of the Plurinational State of Bolivia (ACESSOS).

6. Soliciting and obtaining indigenous peoples' FPIC: process and methodology

25. As previously mentioned, at the present stage of the Project design process it is not possible to identify which indigenous peoples' groups and communities will engage with the Project. As soon as the participation of the states will be determined, and the Project's geographic areas of coverage prioritized on the base of the targeting selection criteria¹²², a **consultation strategy leading to FPIC** will be put in place to identify which indigenous peoples' groups located in the Project's area would be interested in engaging with Project's activities.

26. The consultation strategy will directly involve: (i) the Project's Executing Entity (EE) through its Central Project Management Unit (CPMU) and PMEL Unit, and IFAD; (ii) the local State level implementing unit(SIUs); (iii) FUNAI regional and/or local representations; (iv) indigenous peoples' organizations in the areas targeted by the Project, and; (iv) representatives of indigenous peoples' communities that might be potentially affected by Project's interventions.

27. The main objective of the consultation strategy will be to assess the degree of the expected direct and indirect economic, social, cultural and environmental impacts on indigenous peoples who live in the Project area. However, given the diversity of situations and contexts when seeking FPIC, there will be not an unique or universal way to carry it out. The various instruments that are enshrined in FPIC and implementation experiences will provide general guidelines and qualitative requirements that will guide the processes to solicit and obtain FPIC. Therefore, one of the first steps for seeking FPIC will be to agree with the concerned indigenous peoples' communities on the FPIC process itself. As local communities vary greatly in their sociocultural aspects, history, institutions and approaches to development, the processes that they will agree to undertake may also differ. Translation and interpretation into indigenous languages will have to be ensured throughout the whole process leading to FPIC.

28. During Project's implementation, FPIC will be ensured through a continuous and inclusive process of consultation and participation of the indigenous peoples, aimed at building trust with the communities, their organizations and governance institutions.

29. Overall, the **consultation process leading to the FPIC will be articulated as follows:**

- a) Identify indigenous areas and conduct preliminary consultations with indigenous communities to solicit their FPIC;
- b) Conduct a sociocultural and livelihoods assessment;
- c) Confirm indigenous peoples' interest in engaging with the Project, obtain their FPIC and document the agreement.

a. Identify indigenous areas and conduct preliminary consultations with indigenous communities to solicit their FPIC

30. The CPMU through PMEL, and SIUs together with IFAD will pre-identify indigenous areas within the overall Project's geographic coverage that might be affected by its interventions. The overall criteria applied will be:

- Indigenous peoples' lands or communities located in the rural areas of the semi-arid of the Northeast region, located in the geographic areas covered by the Project.

31. This initial screening will also take into account indigenous peoples' communities with whom IFAD has already established partnerships in the frame of its investments.

32. Once the indigenous peoples' communities will be pre-identified, SIUs will work together with FUNAI regional and/or local offices and indigenous peoples' representative organizations at state/ regional level to prioritize indigenous communities that might engage with the specific projects at the state level. In prioritizing indigenous communities:

- Ensure that the general targeting criteria adopted by the Project to focus on the poorest and most vulnerable communities to social and environmental threats are included and prioritized;
- Ensure that geographic / territorial proximity with the other areas targeted by the Project is respected, to

¹²² On the targeting criteria adopted to identify and select the most vulnerable areas, municipalities and communities, refer to the Targeting section of the main text of the Project proposal.

promote territorial development and foster the exchange of good practices.

33. Furthermore, it is recommended to:

- Involve different indigenous peoples' groups in order to not concentrate activities in one state and with one indigenous group only;
- Assess which kind of activities are being currently developed with indigenous peoples by other actors from the public sector and the civil society in the selected area, in order to complement efforts and do not duplicate investments;
- Be open and receptive to indigenous peoples' willingness to join the Project; the demonstration of interest by the indigenous communities will be key to ensure a smooth implementation of project's activities.

34. Annex 1. provides a list of the Indigenous Lands located in the Northeast region (in the states of Alagoas, Bahia, Ceará, Maranhão, Paraíba, Sergipe) that might be potentially targeted by the Project. To be eligible, Indigenous Lands need to be located in the semi-arid; at the same time, as the majority of the indigenous population in the Northeast region lives outside an Indigenous Land, there might be the need to target communities or conglomerate of indigenous villages, instead of an Indigenous Land.

35. Once the indigenous areas will be identified, the second step will be to contact indigenous peoples' representative organizations/ reference people at the municipal/ local / community levels to kick start preliminary consultations with the indigenous communities. Organizations may also include NGOs or CSOs with proven experience in working with indigenous peoples.

36. Preliminary consultations with indigenous communities will be carried out by SIU and FUNAI together with indigenous peoples' organizations in order to: (i) share the project's objectives and scope and explain the nature of the proposed activities; (ii) clarify on roles and responsibilities of the parties involved; (iii) evaluate potential benefits and risks of the project and; (iv) assess indigenous peoples' interest to engage with the project. On the base of these first consultations, and the interest express, a number of indigenous peoples' groups/ communities will be identified as potential project beneficiaries.

b. Conduct a socio-cultural and livelihoods assessment

37. A socio-cultural and livelihoods assessment in indigenous communities will be carried out, in order to understand the overall context and to start strategizing local interventions together with the indigenous communities¹²³. The assessment will be based on secondary data as well as on primary data collected through consultations carried out in the indigenous communities.

38. The assessment will be aimed to:

- i. Carry out initial diagnosis of the situation in the Indigenous Lands and/ or villages visited, especially in relation to the situation of the local environment and natural resources, food security, productive activities (agricultural and non-agricultural) and other existing sources of income, focusing on the internal mechanisms of social and productive organization;
- ii. Identify the main demands related to productive investments (agricultural and non-agricultural) and capacity building;
- iii. Outline a differentiated working strategy tailored to the indigenous group in question, culturally appropriate to the traditional forms of social and productive organization;
- iv. Identify specific activities to be developed with indigenous women and youth, and actions aimed at the valorization and promotion of indigenous traditional knowledge and practices in natural resource management.

39. The assessment will focus on the social, economic and environmental context of the indigenous area, with particular attention to the situation of natural resources, food and nutrition security and livelihoods strategies, as well as customary laws, decision-making and organizing strategies. The assessment should also identify priorities for productive investments to be carried out in indigenous communities, giving special attention to the most vulnerable segments of the population (ex. women head of household, adolescent girls, youth).

¹²³ In the case of community' s productive investments aimed at strengthening families' resilience, the socio-cultural and livelihood assessment might be embedded into the initial survey in the frame of the development of Investment Plans in Resilience Innovation. See, Component 1 of the Project's proposal.

40. To facilitate the discussion on the above-mentioned topics with indigenous peoples' representatives, a survey will be applied. A sample of the questionnaire (in Portuguese) to conduct the socio-cultural and livelihoods assessment is provided in [Annex 2](#).

41. An analysis of potential risks and vulnerabilities of the project in indigenous communities and tailored measures to minimize and mitigate negative impacts will be included. At the same time, the analysis will highlight the main opportunities in place and measures to enhance positive impacts. Overall, all project activities in indigenous communities will embrace the "do not harm" principle, identifying potential constraints along project's implementation and put in place measures to mitigate unintended negative impacts.

c. Confirm indigenous peoples' interest in engaging with the project, obtain their FPIC and document the agreement

42. The final step will be to confirm the interest of the indigenous communities in engaging with the project and obtain their FPIC; this will include formalize consent agreements, planning expected results and activities and implementing arrangements, and mechanisms to measure results. All consultation undertaken will be documented. The recording of the consultations will include: how participants were selected and invited; what documentation they received beforehand (and in which language); who participated; what was discussed and agreed.

43. The agreement should clearly articulate:

- i. What was discussed and decided (issues, commitments, budget, timeframe, role, responsibilities, etc.);
- ii. Who entered into the agreement (clearly identifying the individuals and their roles) and;
- iii. What mechanisms have been set up to maintain dialogue and address disagreements, including arrangements during implementation and monitoring of the proposed activities.

44. If requested by the community, the agreement should be translated in the indigenous language. The results of FPIC process will orient the development of project's activities with indigenous peoples' communities. The strategy, approaches and implementing arrangements agreed will guide the work of project's staff and service providers throughout the implementation of the project's cycle, including a time-bound planning and specific M&E indicators on how to measure the results according to indigenous peoples' perspectives on well-being¹²⁴.

45. **Methodology.** The methodology employed during the process leading to FPIC will include: surveys, focus groups discussions (with men/ women/ youth) and individual interviews. The methodology will take into account the cultural socio-cultural specificities of each indigenous group, including their different forms of social and economic organization. Particular attention will be given to indigenous traditional knowledge and local management practices, in order to valorize indigenous peoples' collective management of land and natural resources. The methodology to work with indigenous peoples should be updated during project's implementation.

46. In order to promote **gender and generation equity**, the role of women and young people in community management will be assessed. All activities developed with indigenous peoples will ensure inclusion of women and youth in decision-making processes and that, at the same time, the interventions proposed will not increase women's burden of work. Focus groups with women only (and with youth only) is recommended in order to ensure women and youth's full participation in the process of consultation, as well as into project's activities.

7. Grievance and redress mechanism (GRM).

47. Will be developed as stipulated in title 10 of PCRPs Social, Environmental and Climate Assessment Procedures (SECAP) note. The different stages are further described with special attention given to protecting vulnerable social groups (indigenous people and other traditional communities; women) so that their complaints can be fully documented and reported while also ensuring that safeguards are put into place that guarantee their right to privacy and the confidentiality of shared information.

48. Stakeholder groups should be informed about the grievance mechanism, its functions and the steps to be taken for presenting and redressing complaints and grievances. The mechanism should be disclosed in a culturally appropriate manner for indigenous peoples, with a respect for their native languages, as well as their use of time,

¹²⁴ Given the geographic extension of the region where the project will operate and the diverse range of implementing arrangements that might be established, according to the specific state and context, individual community consent agreements might be signed at different stages of project's implementation.

given that indigenous people make use of collective, participatory instances that rely on the expertise and knowledge of elders for reviewing disclosed information, and therefore, have a need of timeframes that are more flexible.

49. In consideration of the power dynamics that tend to place indigenous communities in a situation of disadvantage in relation to other social groups and institutions, as well as the history of violence, which has plagued indigenous and other traditional communities (ex: “Fundos de pasto”; quilombolas), especially in the face of social and environmental conflicts concerning the use of land and natural resources in many of these territories, the complainants’ identities should be kept confidential at all costs in these procedures.

50. This provision will be carried out by the Youth, Gender and traditional communities Specialists at the state level SIUs, who are responsible for stakeholder planning and engagement, and the M & E professionals, who play a key role in monitoring compliances and grievances and communicating with the instances designated for each function. Measures such as these will also be reinforced by project management bodies - specifically the advisory committee and Consultative Councils. The Focal Points on Indigenous Peoples’ Issues will also play a key role in ensuring confidentiality within any grievance processes undertaken by Indigenous people in particular, as well as ensuring that cultural considerations are taken into account during the different stages of the GRM process.

51. The procedures involved with making grievances and the various stages to be followed will be publicly disseminated in the first phase of the Project’s implementation cycle with all stakeholder groups and staff members. The GRM and its forms of operation, will be presented to Project teams in training sessions to ensure that they are fully familiar with its procedures. In capacity-building sessions held with focus groups – women, youth, indigenous groups and other traditional communities – information will be provided on the GRM. The procedures should be publicly advertised and disseminated through simple and culturally appropriate materials, that outline the following content: (i) the timeline for submitting grievances; (ii) expectation of waiting time for acknowledgement, response and resolution of grievances; (iii) description of the transparency of the procedures; (iv) explanation of the governing and decision-making structures, as well as the roles of each of the members of the Project team (ex: Youth, Gender and traditional communities Specialists; M & E professionals); (v) Information about other available grievance mechanisms, beyond the Project’s accredited ones within the immediate scope of PCRCP, such as the GCF Independent Redress Mechanism.

52. Stages and procedures of the grievance redress process within PCRCP:

- (i) **FIRST STEP:** Complaints submitted should be sent to Youth, Gender and traditional communities Specialists at the state level (SIUs) and M & E professionals.

These professionals will be responsible for assessing that the complaints are eligible, providing the necessary information and ensuring that the most vulnerable social groups have their rights safeguarded. In the case of Indigenous People, the Focal Points on Indigenous Peoples’ Issues will serve as liaisons and mediators with these other professionals, due to the need to consider cultural aspects that are specific to each tribe.

- (ii) **SECOND STEP:** Local grievance mechanisms will be activated at the state level. The process of conciliation, that makes use of community systems and mechanisms, is a priority.

Complaints should be taken outside of the community for resolution only when the complaints cannot be resolved through local channels. The complaints will be organized in a database, which should include information about each one of the complaints and their forms of resolution, including the solution provided and the need for redress, if deemed to be necessary. M & E professionals will have a fundamental role in fueling this data base and ensuring that all necessary information is registered once grievances are put forth by Project beneficiaries.

- (iii) **THIRD STEP:** The project level grievance is activated. Claims are registered, investigated and reviewed:
 - 1) 1st level: At this level, received complaints will be registered, investigated and solved by the SIU.
 - 2) 2nd level: If the complaint has not been solved and could not be solved in level 1, the SIU must report it to the CPMU. Received complaints will be registered, investigated and solved by the CPMU. Notwithstanding the above, all complaints may be directly submitted to BNDES (2nd level) where applicable stipulations in the Brazilian norms and in the BNDES ombudsman's office will prevail.

- 3) 3rd level: If the complaint has not been solved and could not be solved in level 2, the complaint must be submitted to IFAD following the procedure stipulated above.

53. The **GCF independent Redress Mechanism**¹²⁵ and the **Secretariat's indigenous peoples focal point** will be available for assistance at any stage, including before a claim has been made. The IRM is an instance that should be activated in cases that have not been able to be resolved through local means and mechanisms. It also represents another channel through which project affected people can seek redress, particularly when related to non-compliance with GCF policies or procedures. If complaints are filed with the independent Redress Mechanism, the accredited entities and executing entities of PCRP as well as any other relevant parties should fully cooperate with the authorities of the IRM by providing all required information.

8. Implementation and monitoring

54. The project executing entity will be responsible to ensure the implementation of the IPPF, in close collaboration the States and with other relevant project partners identified during the design phase.

55. To this aim, the main steps to follow at the initial stage of project implementation will be:

- (i) Include indigenous peoples-related issues in the project's start-up workshop, in order to raise awareness on the FPIC process with project teams, ensuring understanding of FPIC principle and operational mechanisms, review agreements taken, implementing arrangements and timeline of project's activities in indigenous communities;
- (ii) Present the GRM and ensure the project teams are familiar with its procedures;
- (iii) Identify knowledge gaps in the project teams to address indigenous peoples' issues and plan capacity building and training accordingly;
- (iv) Ensure SIUs Hire one/ or more Focal Points on Indigenous Peoples' Issues, that will be responsible to follow-up on activities undertaken in indigenous communities, including defining implementing arrangements for their execution;
- (v) Include indigenous peoples' indicators into baseline surveys/ studies;
- (vi) Where possible community-based monitoring and information systems will be considered and supported;
- (vii) Allocate adequate resources to carry out the proposed activities in indigenous communities.

56. Specific implementing agreements will be taken with indigenous communities during the consultation process.

¹²⁵ Information available at: <https://irm.greenclimate.fund/home>

Annex I. Indigenous Lands in the Brazilian Northeast region

State	Ecological Zone	Indigenous Land (<i>Terra Indígena</i> - TI) Indigenous Reserve (<i>Reserva Indígena</i> –RI)	Indigenous group/s
Alagoas	Mata Atlantica	RI Aconã	Tingui Botó
		TI Kariri-Xokó	Kariri-Xocó
		RI Karapotó	Karapotó
		TI Wassu Cocal	Wassu
	Caatinga/ Sertão	RI Fazenda Canto	Xukuru-Kariri
		TI Xukuru-Kariri	Xukuru-Kariri
		RI Mata da Cafurna	Xukuru-Kariri
		TI Jeripancó	Jiripancó
Bahia	Mata Atlantica	TI Comexatiba (Cahy-Pequi)	Pataxó
		TI Águas Belas	Pataxó
		TI Barra	Kiriri, Atikum
		TI Barra Velha do Monte Pascoal	Pataxó
		TI Barra Velha	Pataxó
		TI Imbiriba	Pataxó
		TI Aldeia Velha	Pataxó
		TI Coroa Vermelha	Pataxó
		TI Mata Medonha	Pataxó
		TI Tupinambá de Belmonte	Tupinambá
		TI Caramuru / Paraguassu	Pataxó Hã-Hã-Hãe
		TI Tupinambá de Olivença	Tupinambá
		TI Fazenda Bahiana (Nova Vida)	Pataxó Hã-Hã-Hãe
	Caatinga/ Sertão	RI Fazenda Jenipapeiro	Atikum
		Fazenda Remanso (Regularization)	Tuxá
		Fazenda Sempreverde (Regularization)	Pankararú
		Fazenda Sitio (Regularization)	Tuxá
		TI Vargem Alegre	Pankaru
		RI Pankaru	Pankaru
		RI Ibotirama	Tuxá
		TI Kiriri	Kiriri
		TI Massacará	Kaimbé
		TI Pankararé	Pankararé
		RI Quixabá	Xukuru-Kariri
		TI Brejo do Burgo	Pankararé
		TI Kantaruré	Kantaruré
		TI Tuxá de rodela	Tuxá de rodela
		RI Riacho do Bento	Tuxá
		RI Nova Rodela (urban area)	Tuxá
		TI Tumbalalá	Tumbalalá
Ceará	Mata Atlantica	TI Lagoa Encantada	Jenipapo-Kanindé
		TI Pitaguary	Pitaguary
		TI Tapeba	Tapeba
		TI Tremembé da Barra do Mundaú	Tremembé
		TI Tremembé de Almofala	Tremembé
		TI Córrego João Pereira	Tremembé
		TI Tremembé de Queimadas	Tremembé
Maranhão	Amazônia Legal	TI Alto Turiaçu	Awá-Guajá; Ka'apor; Timbira
		TI Arariboia	Awá-Guajá; Guajajara
		TI Awá	Awá-Guajá
		TI Bacurizinho	Guajajara

		TI Bacurizinho (reestudo)	Guajajara
		TI Cana Brava	Guajajara
		TI Caru	Awá-Guajá; Guajajara
		TI Geralda Toco Preto	Krepum Katuyê
		TI Governador	Gavião Pukobiê; Guajajara
		TI Kanela	Canela Ramkokamekrá
		TI Kanela/Memortumré	Canela Ramkokamekrá
		TI Krenyê	Krenyê
		TI Krikati	Krikati
		TI Lagoa Comprida	Guajajara
		TI Morro Branco	Guajajara
		TI Porquinhos	Canela Apanyekrá
		TI Rio Pindaré	Guajajara
		TI Rodeador	Guajajara
		TI Urucu- Jurua	Guajajara
		TI Potiguara	Potiguara
Paraíba	Mata Atlântica	TI Potiguara de Monte-Mor	Potiguara
		TI Jacaré de São Domingos	Potiguara
Pernambuco	Serra	TI Xucuru	Xucuru
		TI Xucuru de Cimbres	Xucuru
		TI Kapinawa	Kapinawa
		RI Fulni-ô	Fulni-ô
		RI Tuxá de Inajá/Fazenda Funil	Tuxá
		TI Kambiwa	Kambiwa
		TI Pipipã	Pipipã
		TI Pankararu	Pankararu
		TI Entre Serras	Pankararu
		TI Pankará da Serra do Arapuá	Pankará
		TI Atikum	Atikum
		TI Truká	Truká
Sergipe		TI Caiçara/Ilha de São Pedro	Xoco

Source: Instituto Socioambiental, Terras Indígenas no Brasil: <https://terrasindigenas.org.br/>

Annex 2. Sample of socio-cultural and livelihoods assessment survey (in Portuguese).**QUESTIONÁRIO: DIAGNÓSTICO DA SITUAÇÃO SOCIO-PRODUTIVA DAS COMUNIDADES INDÍGENAS**

DATA	
POVO INDÍGENA	
ALDEIA/ TERRA INDÍGENA/ MUNICÍPIO	
LOCAL/ PARTICIPANTES	
CONTATOS	

DATOS SOBRE A ALDEIA	
Numero de habitantes	
Numero de famílias	
Identificação da(s) liderança(s) na aldeia	
Fundação e tempo de existência da aldeia	
A aldeia têm associação?	

INFRAESTRUTURA E ATENDIMENTO BASICO	
Escola Têm escola na aldeia? Se tiver, até que nível? Quantos alunos têm na escola? Quantos professores trabalham na escola? Se não tiver escola, onde os alunos vão estudar?	
Saúde Têm posto de saúde? Se não tiver, onde fica o posto mais perto ou onde é feito o atendimento? Quantos agentes de saúde trabalham na aldeia? Quais são as principais doenças na comunidade?	
Água Quais são as fontes de acesso e abastecimento de água para uso domestico e para as atividades agrícolas? Têm poço(s)?	
Outras infraestruturas Que outras infraestruturas para uso produtivo existem na aldeia? (<i>ex. Casa de farinha</i>)	

ATIVIDADES PRODUTIVAS	
Que tipo de atividade é realizada exclusivamente para assegurar a alimentação das famílias?	
Que se planta principalmente na roça?	
Qual entre os plantio é a principal fonte de alimento? Que é o que mais se planta?	
Como se realiza o plantio? (<i>técnica utilizada</i>)	

A produção agrícola satisfaz a alimentação das famílias?	
Existe excedente na produção agrícola para comercialização? (No caso, especificar que tipo de produtos estão à venda e onde ela é realizada)	
Que é que você gostaria produzir que não têm?	
As sementes, vocês tem ou compram de fora?	
Quais são as principais dificuldades na produção?	
Como se desenvolve o trabalho para a produção agrícola? (Ex. Por família nuclear ou extensa, por grupos, etc.)	
Têm criação de animais de pequeno porte? Quais?	
Que é o que você come durante o dia? O que é que é produzido aqui e que compra de fora?	

ATIVIDADES NÃO PRODUTIVAS	
Têm produção de artesanato para uso interno ou para a venda?	
Existem pontos e negócios de comércio na aldeia?	
Tem funcionários públicos na aldeias? Quantos? (ex. Professores, agentes de saúde, funcionários de FUNAI)	
Que outras fontes de renda existem? (Ex. Aposentadoria, Bolsa Família)	

CONSIDERAÇÕES FINAIS	
Que poderia ser feito para melhorar a qualidade de vida na aldeia? (Especificar tipo de atividade)	
De que forma as atividades deveriam ser desenvolvidas? (Ex. Por família nuclear, por família extensa, por associação, por grupos de famílias/ aldeias..)	
Considerações Finais para o Projeto	

DIAGNÓSTICO DA SITUAÇÃO AMBIENTAL	
Qual é a situação climática com relação à seca? As queimadas tem sido frequentes nos últimos anos?	
Qual é a situação dos recursos madeireiros?	
Tem invasão ilegal de madeireiros na aldeia?	
Tem fiscalização dos limites da Terra Indígena ou da aldeia? Feita por quem?	
Como é a situação da caça? E do peixe?	

APPENDIX II

Principles and Practices for Design and Implementation of Climate Resilient Productive Systems (CRPS) in Semi-arid Northeast Brazil

Introduction

FAO¹²⁶ (based on IPCC¹²⁷) classified technologies and practices that improve farmer's climate resiliency in: improved agronomic practices, integrated nutrient management, tillage and residue management, water management, and agroforestry. These practices are often grouped and referred to as Climate Resilient Agriculture, or Climate-Smart Agriculture, and can consist of several methods, arrangements, and technologies. What is climate resilient to one biome or a production system may not be applicable to another. Climate challenges are also varied in any given geography and adaptation solutions depend on the size of the area and resources available to the farmer. Thus, IFAD hired a team of expert consultants including agronomists, environmental scientists, an anthropologist and a farmer; who spent three weeks in the field consulting with several farmers, NGOs, technical assistance teams as well as universities and research institutions; to respond to the following question: what is climate resilient agriculture for family farmers in the Brazilian semi-arid?

Six guiding principles for Resilient Systems in Semi-arid North-east Brazil

The Project will encourage family farmers to apply principles and practices of resilient production to set up two integrated and interdependent agricultural subsystems to ensure productivity during twelve months of the year: one specialized dry subsystem and only depending on the in the rainy season for water and another specialized year-round production, that makes use of specific water sources and storage, particularly during the long dry season. In the semi-arid region, IFAD found that the concept of climate resilient production translates into practices that will increase availability, flow and retention of water in the system. Pragmatically, it means the simultaneous implementation of the following practices and principles, that shall define what Climate Resilient Productive Systems (CRPS):

- (i) Soil Preparation: Maintenance of dispersed trees, setting up cradles and natural fertilization;
- (ii) Soil Protection: Soil cover and biomass production with resilient plant varieties;
- (iii) Water management: capture and storage (both in soil and vegetation), contour lines or curves and terraces;
- (iv) Planting practices: seeking to enhance stratification, diversification and densification with herbaceous, shrub and tree species maximizing photosynthetic capacity of the plot;
- (v) Management of cultivated vegetation: active pruning and thinning;
- (vi) Sustainable animal husbandry: pasture rotation and fences.

While most of the practices to be supported (see Table A below) have the potential to yield sustainable land management benefits and increase production, they require a significant change in farmers' practices and quite substantial investments. GCF support will enable farmers to take a longer-term perspective in anticipation of the

126 BRANCA, G. et al. **Climate-Smart Agriculture: A Synthesis of Empirical Evidence of Food Security and Mitigation Benefits from Improved Cropland Management**. Rome: FAO, 2011. 35 p.

127 IPCC. **Climate Change 2007: Mitigation of Climate Change. Working Group III contribution to the Fourth Assessment Report of the IPCC**. Cambridge, United Kingdom and New York, NY, USA Cambridge University Press, 2007.

significant financial, economic and livelihood benefits achievable through the application of adaptation measures relative to the declines in production and income that are anticipated to result from the effects of climate change.

GCF support responds to the greatly added urgency which climate change projections give to the application of these practices, and recognizes that for them to function effectively as adaptation measures, they must be applied as part of a larger scale program and be directed and adjusted considering the needs, priorities and cultural specificities, both regional and at the level of productive units.

These practices are interlinked and their benefits are synergic, which means they must be implemented together. Assembling an agricultural system with these elements makes it a water producer, not a consumer, which is the correct approach for a region with low water availability. Table 2 below presents the adaptation benefits that each principle provides to the family farmer.

Table 6. Principles and Practices of Climate Resilient Agriculture Production in the Semiarid

Practices / Adaptation Benefits	Retain soil moisture	Recharge soil moisture	Increase organic matter in soil	Increase photosynthesis	Increase soil carbon	Capture water	Capture humidity in air	Improve microclimate	Reduce erosion
(i) Soil Preparation: Maintenance of dispersed trees, micro-valleys and natural fertilization	X		X	X				X	X
(ii) Soil Protection: Soil cover and biomass production with resilient plant varieties	X		X		X	X	X		X
(iii) Water retention: level curves and terraces		X				X			X
(iv) Planting: Stratification, diversification and densification			X	X		X		X	X
(v) Management: Active pruning and thinning;				X				X	
(vi) Grazing: Pasture rotation and fences.			X	X	X				X

(i) Soil Preparation

The first step in soil preparation is to eliminate the slash and burn as a method of land clearing, since studies show it is inappropriate for agricultural production in the semiarid because it continuously degrades soil and biodiversity of the *Caatinga*.¹²⁸ Land clearing for pastures and plantations will be performed by selecting, pruning and maintaining dispersed trees. Maintaining or even increasing the number of dispersed trees in the pastures in the dry tropics that endure prolonged dry periods, represents an option to increase the productivity, profitability and sustainability of animal husbandry systems.^{129,130} The removed biomass from the land clearing will serve as soil cover as explained in part (ii).

Soil preparation activities must be carried out during the dry period, well before the first rainfall, so the plants and animals can take advantage of all the water for their development, avoiding delays and compromising results. Cradles for planting seedlings or seeds should be opened, reserving the top soil to put back into the cradle at the time of planting. They must be rich in nutrients to allow the plants to have enough food grow. The use of natural fertilization will be encouraged, be it the fertilizer of ruminants or directly from the biomass produced by the system as well as phosphate and, if possible, rock dust. Fertilization is not a simple provision of nutrients to the plant, it has the function of activating the soil biological activity and involves the cycle of water and minerals. If plantation lines are contemplated, they should be concave in their longitudinal axis to accommodate the natural

128 MAMEDE, M.; ARAÚJO, F. Effects of slash and burn practices on a soil seed bank of *Caatinga* vegetation in Northeastern Brazil. *Journal of Arid Environments*, n. 72, p. 458 - 470, 2008.

129 ARAÚJO FILHO, J. A. *Manejo pastoril sustentável da caatinga*. Recife, PE: Projeto Dom Helder Camara, 2013. 200 p.

130 LASCO, R. D.; DELFINO, R. J. P.; ESPALDON, M. L. O. Agroforestry systems: helping smallholders adapt to climate risks while mitigating climate change. *Wiley Interdisciplinary Reviews: Climate Change*, v. 5, n. 6, p. 825 - 833, 2014.

humidity of the environment and favor the development of the plantation, creating a micro-valley where the root of the plant is located.¹³¹

(ii) Soil Protection

The soil is a living organism and, thus, needs feeding. Biomass or organic matter is the vital food of the soil, especially in the tropical climate, where nutrient cycling is vigorous and the decomposition of organic matter is quick. A malnourished plant under stress of any origin, increases respiration, reduces photosynthesis, and consequently accumulates less carbohydrates, water and produces smaller harvests. A compacted soil with little macrobiotic life prevents roots from obtaining nutrients and water. Therefore, to meet the needs of the plant, the farmer must protect the soil from sun, wind and rain, in addition to nourishing the fauna. Healthier plants result in photosynthetic efficiency that ensures better yields. This is so significant, that if there is availability at low cost, family farmers will be encouraged to bringing biomass from outside sources to cover the soil.

In order to grow biomass, a plantation matrix must be constructed with specialized species that photosynthesize during the long dry season that is natural in the dynamic of the *Caatinga*. This means combining plants into a system that is capable of producing biomass and accumulating water during all year long, including under the stress of climate induced droughts. This matrix should consist of cacti, euphorbiaceae, spondias and agavaceous.

If this is possible, at the beginning of the implementation, farmers will produce forage for animals and food for human consumption. Always observing, however, that the biomass that is withdrawn from the system should be the smallest part (1/3), leaving most of it (2/3) to feed the system itself. These fractions will reverse as the soil becomes more fertile and the system healthier.

(iii) Water management

Water can be considered the main limiting factor for agriculture and animal husbandry in the *Caatinga* zone. Nevertheless, the water debate should be focused not on its absence but on how to preserve water during the rainy season so that it can be used during the rest of the year.

It is fundamental to understand that the most important water reserve must be the soil itself. This can be accomplished by reconstructing the natural infiltration promoted by the forest systems that have been depleted. To build a Climate Resilient Productive System in degraded and compacted areas, such as the ones often found in the Semi-arid region, it is necessary to plant in terraces and along contour lines, as well as installing artificial systems for capture, storage and infiltration of rain water, such as ditches, reservoirs and microbasins, to eliminate runoff and promote forced recharge, and thus improve soil hydration.¹³²

Component 2 details several water harvesting techniques which have are being widely used in the region. It is crucial, nevertheless, that these technologies be implemented as a means to shift the culture of production in the *Caatinga* towards climate resiliency. Implemented with the current agricultural practices, these technologies will only increase the dependency on external water and fertilization resources, as soils will continue to degrade and compact. Yet, with the development of the Climate Resilient Productive Systems proposed here, the infiltration can occur naturally making more springs perennial and promoting a biological water reserve in the roots and leaves of specialized vegetation (species such as forage cactuses, mandacaru, deer papaya, umbu, sisal, piteira, aloe).

131 SOUSA, H.; MATOS ALMEIDA, S. R. **Jardinagem Florestal: Criando e manejando Agroflorestas de alimentos**. SI: Edição do Autor, 2016.

132 BRANCA, G., et al. **Climate-smart agriculture: a synthesis of empirical evidence of food security and mitigation benefits from improved cropland management**. Rome: FAO, 2011.35 p.

(iv) Planting practices: stratification, diversification and densification

Stratified, diversified and densified cropping patterns increase the photosynthetic capacity of the land, and therefore, the volume of biomass produced per cultivated area, increasing water circulation and promoting an improvement in the microclimate.¹³³

The competition between plants takes place in the strata and not for water or nutrients. Plants of different strata harmonize because they have different light requirements. Crops of the lower stratum produce in the shade, those of the middle stratum need a little more luminosity, and so on, up to those of the emergent stratum that require full light. A system with photosynthetic efficiency associates plants belonging to different strata, that do not compete with each other.

According to Sousa¹³⁴, the strata and their respective occupancy rates can be:

- Ground stratum, plants can occupy 10 to 20% of the horizontal space
- Low stratum, plants can occupy 80 to 90% of the horizontal space
- Medium stratum, plants can occupy 50 to 60% of the horizontal space
- High stratum, plants can occupy 20 to 40% of the horizontal space
- Emergent stratum, plants can occupy 10 to 25% of the horizontal space

Whereas in a monoculture, the potential photosynthesis can reach up to 100% in any given areas, in stratified plantations, it can vary from 160% to 235%. Considering that the sun is the only source of energy, this energy needs to be harnessed to the highest intensity. Thus, maximum plant cover is necessary. The horizontal density that complements the stratification uses both commercial and non-commercial species, the latter to be used to generate biomass that will be incorporated into the system.¹³⁴

Several studies suggest that stratified systems may be more resilient to extreme climatic conditions than annual crops and tree-crop monocultures, as they have several mechanisms to reduce the impact of droughts, such as buffering of humidity, reduction of air and soil temperature extremes, windbreaks and shelter belts to slow wind speed and reduce water loss from evapotranspiration.^{135,136}

The diversification and stratification must increase in time as the system progresses. First, the project will promote tested consortium models can both improve the production conditions as well stimulate discussions on new agricultural practices and combinations between the species the farmer is already familiar with. As the system becomes more productive, the diversity and quantity of products will increase and, in return, the system it will produce water instead of consuming it.

(v) Management of cultivated vegetation: active pruning and thinning

Pruning, thinning and removal of the senile individuals, to open more space to restart the planting process under more evolved conditions is crucial to the success of the system. Short-cycle crops (herbaceous and shrubs) inter-cropped with tree species (timber and fruit) should be planned, so that after a few years of agricultural production, the trees may be cut to form a new clearing, thus restarting a new production cycle. As the productive environment

133 LASCO, R. D.; DELFINO, R. J. P.; ESPALDON, M. L. O. Agroforestry systems: helping smallholders adapt to climate risks while mitigating climate change. **Wiley Interdisciplinary Reviews: Climate Change**, v. 5, n. 6, p. 825 - 833, 2014.

134 SOUSA, H.; MATOS ALMEIDA, S. R. **Jardinagem Florestal: Criando e manejando Agroflorestas de alimentos**. SI: Edição do Autor, 2016.

135 BRANCA, G., et al. **Climate-smart agriculture: a synthesis of empirical evidence of food security and mitigation benefits from improved cropland management**. Rome: FAO, 2011. 35 p.

136 MICCOLIS, A. et al. **Restauração Ecológica com Sistemas Agroflorestais: como conciliar conservação com produção. Opções para Cerrado e Caatinga**. Brasília: Instituto Sociedade, População e Natureza – ISPN/Centro Internacional de Pesquisa Agroflorestal – ICRAF, 2016. 266 p.

improves permanently, increasing production and productivity, there is no need for the farmer to leave the plot and clear new land.¹³⁷

Natural pruning - caused by wind, lightning, insects - is used by Nature to 'organize' natural forest systems. The function of pruning is the input of organic waste and the rejuvenation of the species and the system. In cultivated systems, pruning can serve several general purposes simultaneously: ensure structure in the stratum of the system; production of biomass to protect and feed soil; production of stakes and stems for planting or fences; forage production; or for marketing such as firewood, stakes, etc. Pruning can also be carried out with more specific objectives, as is the case of the pruning of food species to boost production and of timber species to produce a better stem.

Swidden agriculture is an ancestral technique; to a certain extent it is the indigenous agriculture or itinerant cultivation, which, after abandoning the area, relies on Nature for the recovery of soil fertility, through regeneration of the natural vegetation. Planned and practiced on the basis of the principles of forest management, CRP Systems are a model of food production that guarantees recovery, improvement and conservation of the soil, production of clean, sweet and crystalline water, abundance of healthy foods, and food security and sovereignty for the farming family.

It is important to reinforce that with this kind of active management; the whole system sprouts vigorously, generating more biomass production. When this practice is done correctly and at the appropriate time, the system becomes resistant to drought periods and acquires resilience for a good use of the rainy season.

(vi) Sustainable animal husbandry: pasture rotation and fences

Animal husbandry, especially goats and sheep, is the main activity of the family farmer beneficiaries of this Project. Many authors have shown that stratified systems with trees can provide benefits for this activity¹³⁸. Trees can be an important source of shade and shelter to animals improving productivity by reducing heat stress in tropical climates. In addition, some tree species produce leaves and pods which are highly palatable to these animals and are available during the dry season when pastures are of a low nutritional quality. Native trees of the *Caatinga* (such as *faveleira* or *carnaúba*) improve weight gain and milk production.¹³⁹ However, grazing and forage management need to be adapted so as to increase resilience to climate change.

Areas with a low grazing pressure show a higher diversity of plant species than areas with a higher grazing intensity. To implement the climate resilient production proposed here, there needs to be a reduction of free-roaming livestock, fodder storage as well as pasture rotation¹⁴⁰.

Forage will be grown with the system described above.¹⁴¹ Especially in the first few years, nevertheless, animals should not interfere in the system, thus making fences necessary. The installation of live fence that require no maintenance or renovation will be encourage. These live fences/trees can be part of the system and fulfill several other functions such as wind-breaking, biomass production; fruits and fodder production and also serve as shelter for the animals.

137 SOUSA, H.; MATOS ALMEIDA, S. R. **Jardinagem Florestal: Criando e manejando Agroflorestas de alimentos**. SI: Edição do Autor, 2016.

138 ESQUIVEL MIMENZA, H. **Tree resources in traditional silvopastoral systems and their impact on productivity and nutritive value of pastures in the dry tropics of Costa Rica**. 2007. (MSc). CATIE, Turrialba, Costa Rica.

139 ARAÚJO FILHO, J. A. **Manejo pastoril sustentável da caatinga**. Recife, PE: Projeto Dom Helder Camara, 2013. 200 p.

140 SCHULZ, K. et al. Grazing, forest density, and carbon storage: towards a more sustainable land use in Caatinga dry forests of Brazil. *Regional Environmental Change*, v. 18, n. 7, p. 1969 – 1981, 2018.

141 MICCOLIS, A. et al. **Restauração Ecológica com Sistemas Agroflorestais: como conciliar conservação com produção. Opções para Cerrado e Caatinga**. Brasília: Instituto Sociedade, População e Natureza – ISPN/Centro Internacional de Pesquisa Agorflorestal – ICRAF, 2016. 266 p.

Diversity of Climate Resilient Models

In addition to the adaptation benefits laid out above, the practices prosed in this project have the potential to reduce atmospheric carbon by storing it in the aboveground biomass of trees, in soil organic carbon and, indirectly, by reducing pressure for forest clearance.

In the Brazilian semiarid, it should be noted that there are several concrete models that apply the practices and principles of CRPS cited in Table A. For instance, during one of the preparatory field missions, IFAD team had the opportunity to learn about the ‘syntrophic’¹⁴² model from a farming family in the municipality of Riachão do Jacuípe. This system is characterized by being extremely diversified, managed with pruning and densification, and for having as its main productive activities: goat rearing (milk and meat), vegetables and fruits. Another case observed during the project's design mission was the agroforestry model of forage production, which is based on the planting of forage cactuses and various other forage tree species.

There are records in the literature of CRPSs developed by Embrapa Goats and Sheep Research Centre, located in Sobral. This model is characterized by the management of *Caatinga* areas with thinning, ‘lowering’¹⁴³ and enrichment techniques. This kind of system has already been successfully implemented in land reform settlements located in Rio Grande do Norte¹⁴⁴, as a result of the work of the IFAD-funded Projeto Dom Helder Camara. It is also worth mentioning the *recaatingamento* model, which is designed for the recovery of degraded areas and is being used in the region that is known as the Sertão do São Francisco da Bahia Territory.¹⁴⁵

Mentioning these examples, we want to point out, on the one hand, that there are already some proposals of CRPS being implemented by family farmers with positive results. Although these examples follow the same general principles, the diversity (of size, crops, arrangement) is as a key element to deal with the different situations that characterize the reality of the target region. On the other hand, these examples also indicate that such initiatives are few and far between, not yet reaching a larger scale.

142 Syntropic’ Agriculture is a term referring to a na agroforestry farming system (AFS) based on the concept of syntropy (contrary to entropy) characterized by the organization, integration, equilibrium and preservation of energy in the environment (MONTE, A. L. **Sintropia em agroecossistemas: subsídios para uma análise bioeconômica**. 2013. 112 p. (MSc). Mestrado Profissional em Desenvolvimento Sustentável, Universidade de Brasília, Brasília.)

143 This means pruning the higher branches of trees so as to induce sprouting that is easy to reach for the grazing animals.

144 SIDERSKY, P.; JALFIM, F.; RUFINO, E. Combate à pobreza rural e sustentabilidade no semi-árido nordestino: a experiência do Projeto Dom Helder Câmara. **Agriculturas: experiências em agroecologia**, v. 5, n. 4, p. 23 - 28, 2008.

145 Cf. o site: <http://www.recaatingamento.org.br/>

Appendix III

SECAP Risk Categorization Screening Questionnaire

Guiding questions for environment and social screening	Yes/no	Comments/explanation
Category A – the following may have significant and often irreversible or not readily remedied adverse environmental and/or social implications.		
Project location		
1. Would the project develop any wetlands? (Guidance statement 1)	No	
2. Would the project cause significant adverse impacts to habitats and/or ecosystems and their services (e.g. conversion of more than 50 hectares of natural forest, loss of habitat, erosion/other form of land degradation, fragmentation and hydrological changes)? (Guidance statements 1, 2 and 5)	No	
3. Does the proposed project target area include ecologically sensitive areas, areas of global/national significance for biodiversity conservation, and/or biodiversity-rich areas and habitats depended on by endangered species? (Guidance statement 1)	No	
4. Is the project location subjected to major destruction as a result of geophysical hazards (tsunamis, landslides, earthquakes, volcanic eruptions)?	No	
Natural resources		
5. Would the project lead to unsustainable natural resource management practices (fisheries, forestry, livestock) and/or result in exceeding carrying capacity. For example, is the development happening in areas where little up-to-date information exists on sustainable yield/carrying capacity? (Guidance statements 4, 5 and 6)	No	
6. Would the project develop large-scale aquaculture or mariculture projects, or where their development involves significant alteration of ecologically sensitive areas?	No	
7. Would the project result in significant use of agrochemicals which may lead to life-threatening illness and long-term public health and safety concerns? (Guidance statement 14)	No	
8. Does the project rely on water-based (groundwater and/or surface water) development where there is reason to believe that significant depletion and/or reduced flow has occurred from the effects of climate change or from overutilization? (Guidance statement 7)	No	
9. Does the project pose a risk of introducing potentially invasive species or genetically modified organisms which might alter genetic traits of indigenous species	No	

or have an adverse effect on local biodiversity? (Guidance statement 1)		
10. Does the project make use of wastewater (e.g. industrial, mining, sewage effluent)? (Guidance statement 7)	No	The project does not make use of wastewater, however, it does include small family size units of green septic tanks to treat wastewater. Small family units of greywater treatment and reuse will also be installed.
Infrastructure development		
11. Does the project include the construction/rehabilitation/upgrade of dam(s) and/or reservoir(s) meeting at least one of the following criteria? - more than 15 metre high wall; - more than 500 metre long crest; - more than 3 million m ³ reservoir capacity; or - incoming flood of more than 2,000 m ³ /s (Guidance statement 8)	No	
12. Does the project involve large-scale irrigation schemes rehabilitation and/or development (more than 100 hectares per scheme)? (Guidance statement 7)	No	
13. Does the project include construction/rehabilitation/upgrade of roads that entail a total area being cleared above 10 km long, or any farmer with more than 10 per cent of his or her private land taken? (Guidance statement 10). Will the works entail temporary and/or permanent resident workers?	No	
14. Does the project include drainage or correction of natural waterbodies (e.g. river training)? (Guidance statement 7)	No	
15. Does the project involve significant extraction/diversion/containment of surface water, leaving the river flow below 20 per cent environmental flow plus downstream user requirements? (Guidance statement 7)	No	
Social		
16. Would the project result in economic displacement or physical resettlement of more than 20 people, or impacting more than 10 per cent of an individual household's assets? (Guidance statement 13)	No	
17. Would the project result in conversion and/or loss of physical cultural resources? (Guidance statement 9)	No	
18. Would the project generate significant social adverse risk/impacts to local communities (including disadvantaged and vulnerable groups, indigenous people, persons vulnerable to GBV and sexual exploitation and abuse and people with disabilities) or	No	

other project-affected parties? (Guidance statement 13)		
Other		
19. Does the project include the manufacture and transportation of hazardous and toxic materials which may affect the environment? (Guidance statement 2)	No	
20. Does the project include the construction of a large or medium-scale industrial plant?	No	
21. Does the project include the development of large-scale production forestry? (Guidance statement 5)	No	
Rural finance		
22. Does the project support any of the above (Question 1 to Question 21) through the provision of a line of credit to financial service providers? (Guidance statement 12)	No	
Category B – the following may have some adverse environmental and/or social implications which can be readily remedied.		
Location		
23. Does the project involve agricultural intensification and/or expansion of cropping area in non-sensitive areas that may have adverse impacts on habitats, ecosystems and/or livelihoods? (Guidance statements 1, 2 and 12)	No	
Natural resource management		
24. Do the project activities include rangeland and livestock development? (Guidance statement 6)	No	
25. Does the project involve fisheries where there is information on stocks, fishing effort and sustainable yield? Is there any risk of overfishing, habitat damage and knowledge of fishing zones and seasons? (Guidance statement 4)	No	
26. Would the project activities include aquaculture and/or agriculture in newly introduced or intensively practiced areas? Do project activities include conversion of wetlands and clearing of coastal vegetation, change in hydrology or introduction of exotic species? (Guidance statement 4)	No	
27. Do the project activities include natural resource-based value chain development? (Guidance statements 1, 6 and 12)	No	
28. Do the project activities include watershed management or rehabilitation?	No	

29. Does the project include large-scale soil and water conservation measures? (Guidance statements 1 and 5)	No	
Infrastructure		
30. Does the project include small-scale irrigation and drainage, and small and medium dam subprojects (capacity < 3 million m ³)? (Guidance statements 7 and 8)	Yes	Small scale irrigation is included
31. Does the project include small and microenterprise development subprojects? (Guidance statements 12 and 13)	Yes	Producer's organizations will be provided with tools and supplies for market access
32. Does the project include the development of agroprocessing facilities? (Guidance statements 2, 6 and 12)	No	
33. Would the construction or operation of the project cause an increase in traffic on rural roads? (Guidance statement 10)	No	
Social		
34. Would any of the project activities have minor adverse impacts on physical cultural resources? (Guidance statement 9)	No	
35. Would the project result in physical resettlement of 20 people or less, or impacting less than 10 per cent of an individual household's assets (Guidance statement 13)?	No	
36. Would the project result in short-term public health and safety concerns? (Guidance statement 14)	No	
37. Would the project require a migrant workforce or seasonal workers (for construction, planting and/or harvesting)? (Guidance statement 13)	No	
Rural finance		
38. Does the project support any of the above (Question 23 to Question 37) through the provision of a line of credit to financial service providers? (Guidance statement 12)	No	

Guidance for categorization

“Yes” response to any questions between 1 and 22	Environmental and social category is A	Environmental and Social Impact Assessment or an Environmental and Social Management Framework (full or specific) is required depending on availability of information.
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Also, some specific questions would require the below specific actions:

		<ul style="list-style-type: none"> • Yes to question 16 – A Resettlement Action Plan is required depending on availability of information. • Yes to question 17 – A Physical Cultural Resources Management Plan is required that includes provisions for managing chance finds at implementation. • Yes to question 18 – Free, prior and informed consent should be obtained/Free, Prior and Informed Consent Implementation Plan is required depending on whether the affected communities are identifiable. In instances where indigenous peoples are affected an Indigenous Peoples Plan is required. A Social Impact Assessment is required. • Yes to question 8 and/or question 15 – A water resources management plan for the project is required. • Yes to question 7, question 9 and/or question 19 – A pest management plan is required.
“No” response to all questions between 1 and 22 and “Yes” response to any questions between 23 and 38	Environmental and social category is B	An environmental and social analysis to develop an Environmental and Social Management Plan (ESMP) is required.
“No” response to all questions between 1 and 38	Environmental and social category is C	No further analysis is required.

In case projects fall under both category A and B, the highest category will be taken as reference. The determination of the project category and classification will depend on the magnitude of impacts and would depend on the scale of such activities; a cautious approach to the concern of cumulative impacts is considered essential. In such cases, the necessary environmental and social analysis and associated budget should be incorporated into project design. Such projects may be considered for category B.

Determining the environmental and social category A, including the extent of assessments and studies to be conducted, will also take into account available information, i.e. recent studies and assessments, including other initiatives in the country, to the extent these are relevant to the proposed project.

Declassification (from A to B or from B to C) may also be possible in case negative externalities are being addressed by other projects or activities implemented by third parties.

Guiding questions for climate risk screening	Yes	No	Additional explanation of “yes” response*
1. Is the project area subject to extreme climatic events, such as flooding, drought, tropical storms or heat waves?	X		
2. Do climate scenarios for the project area foresee changes in temperature, rainfall or extreme weather that will adversely affect the project impact, sustainability or cost over its lifetime?	X		

3. Would the project make investments in low-lying coastal areas/zones exposed to tropical storms?		X	
4. Would the project make investments in glacial areas and mountains zones?		X	
5. Would the project promote agricultural activity in marginal and/or highly degraded areas that have increased sensitivity to climatic events (such as on hillsides, deforested slopes or floodplains)?		X	
6. Is the project located in areas where rural development projects have experienced significant weather-related losses and damages in the past?	X		
7. Would the project develop/install infrastructure in areas with a track record of extreme weather events?		X	
8. Is the project target group entirely dependent on natural resources (such as seasonal crops, rainfed agricultural plots, migratory fish stocks) that have been affected by in the last decade by climate trends or specific climatic events?			
9. Would climate variability likely affect agricultural productivity (crops/livestock/fisheries), access to markets and/or the associated incidence of pests and diseases for the project target groups?		X	
10. Would weather-related risks or climatic extremes likely adversely impact upon key stages of identified value chains in the project (from production to markets)?			
11. Is the project investing in climate-sensitive livelihoods that are diversified?			
12. Is the project investing in infrastructure that is exposed to infrequent extreme weather events?			
13. Is the project investing in institutional development and capacity-building for rural institutions (such as farmer groups, cooperatives) in climatically heterogeneous areas?			
14. Does the project have the potential to become more resilient through the adoption of green technologies at a reasonable cost?			
15. Does the project intervention have opportunities to strengthen indigenous climate risk management capabilities?			Maybe, depending on selected states and target area.
16. Does the project have opportunities to integrate climate resilience aspects through policy dialogue to improve agricultural sector strategies and policies?		X	The project was designed to integrate climate resilience measures.
17. Does the project have potential to integrate climate resilience measures without extensive additional costs (e.g. improved building codes, capacity-building, or including climate risk issues in policy processes)?		X	The project was designed to integrate climate resilience measures.
18. Based on the information available would the project benefit from a more thorough accounting of GHG emission ?		X	FAO has done so. Please see Annex 22

Appendix IV

State short profiles

BAHIA

Precipitation

Average annual rainfall is approximately 550 mm / year decreasing by 91.70 mm since 1981. For the period 1981 – 2019, december has been the rainiest month on average with 92.74 mm while Semptember presents the lowest average rainfall at 11.40 mm. Rainfall patterns are erratic with deviations ranging from - 74.59 to 179.63mm.

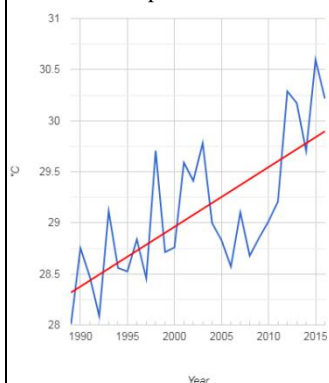
Temperatures

Average annual minimum temperature is 20.15°C, while maximum temperature is 29.90°C. For the period 1981 – 2016 october presents the highest average temperature at 30.59°C, while August was the lowest at 17.48°C ; minimum and maximum temperature have increased by 0.87°C and 1.58°C respectively.

Land Productivity Dinamics

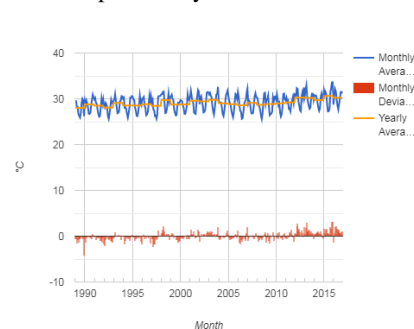
Caatinga portion of Semiard Bahia has 72% of land territory with declining productivity, an additonal 20% present early signs of decline or are stable but stressed. Similar patterns apply throughout B.

Max Temperature 1989 – 2016



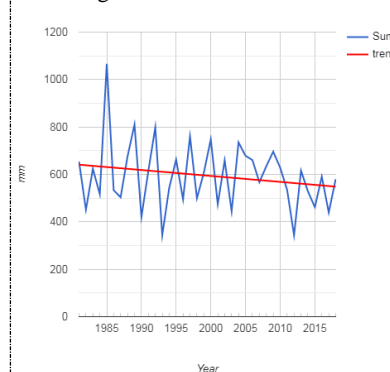
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2016



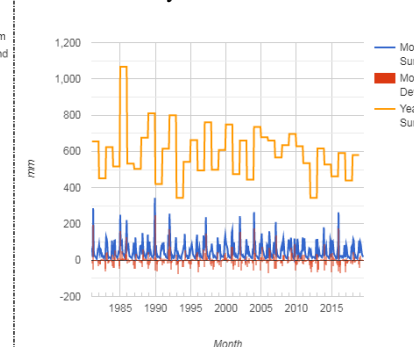
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



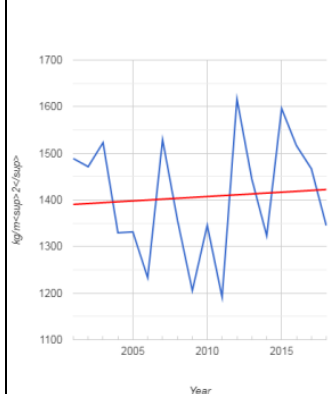
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



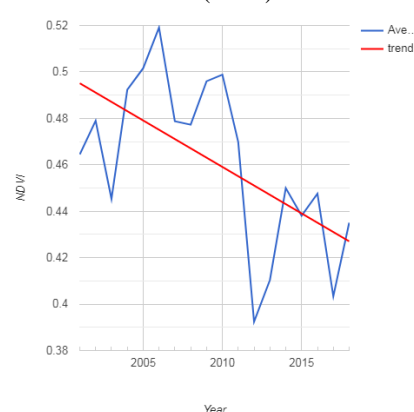
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



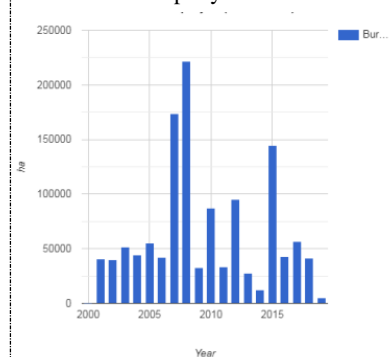
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



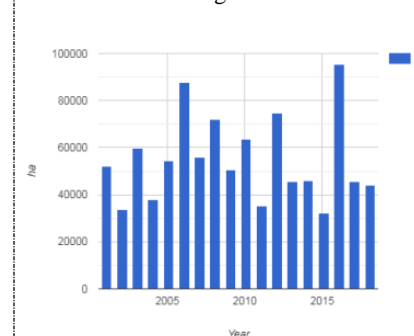
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018¹⁴⁶

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and wildfire; and mildly to highly vulnerable to water scarcity and extreme heat.¹⁴⁷ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

146 Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

147 Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

PIAUI

Precipitation

Average annual rainfall is approximately 760 mm / year decreasing by 66.31 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 182.25 mm while August presents the lowest average rainfall at 2.12 mm. Rainfall patterns are erratic with deviations ranging from -105.94 to 263.85 mm.

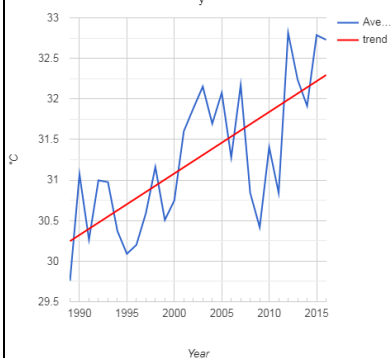
Temperatures

Average annual minimum temperature is 22.81°C, while maximum temperature is 32.29°C. For the period 1981 – 2016 october presents the highest average temperature at 34.17°C, while July was the lowest at 20.85°C ; minimum and maximum temperature have increased by 1.20°C and 2.05°C respectively.

Land Productivity Dynamics

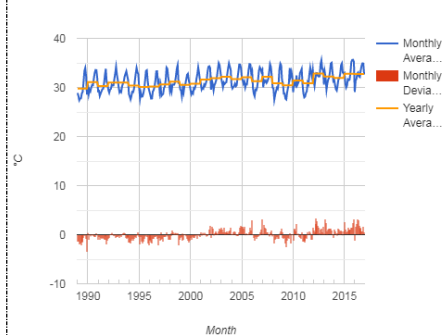
Caatinga portion of Semiard Piaui has 81% of land territory with declining productivity, an additional 13.5% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



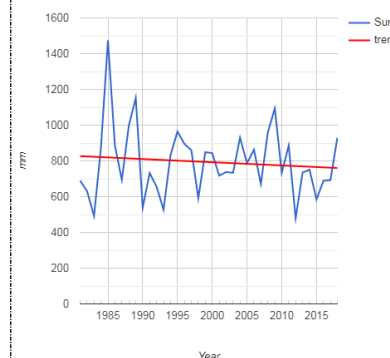
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2016



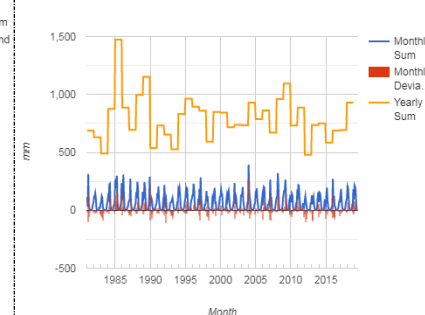
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



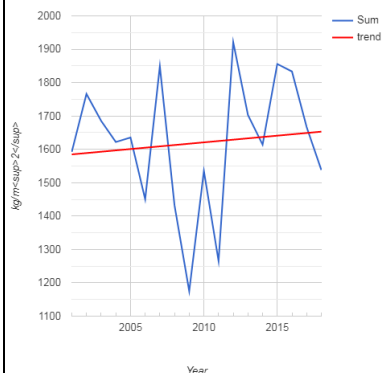
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



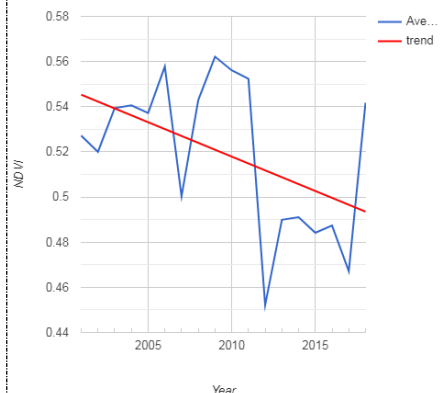
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



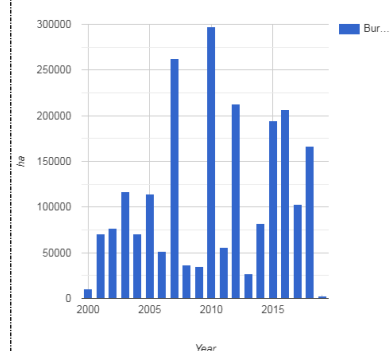
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



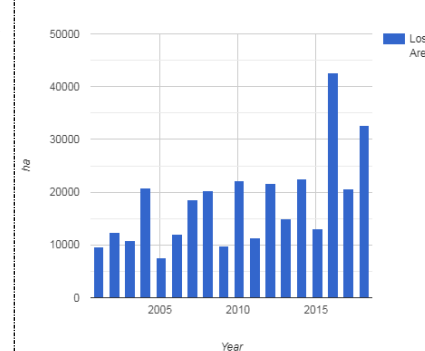
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018¹⁴⁸

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and loss of tree cover and wildfire (particularly high risk for the Serra das Confusões national park); and medium to high vulnerability to water scarcity and extreme heat.¹⁴⁹ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

148 Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

149 Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

CEARA

Precipitation

Average annual rainfall is approximately 735 mm / year decreasing by 85.90 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 200.92 mm while September presents the lowest average rainfall at 3.47 mm. Rainfall patterns are erratic with deviations ranging from -117.33 to 261.48 mm.

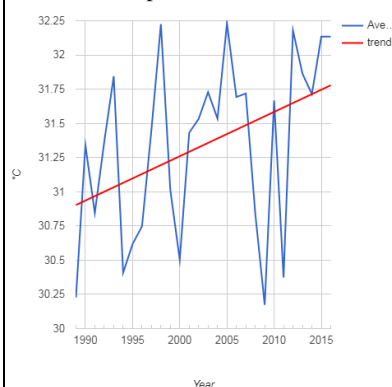
Temperatures

Average annual minimum temperature is 22.37°C, while maximum temperature is 31.78°C. For the period 1981 – 2016 November presents the highest average temperature at 33.72°C, while July was the lowest at 21.20°C ; minimum and maximum temperature have increased by 0.59°C and 0.88°C respectively.

Land Productivity Dinamics

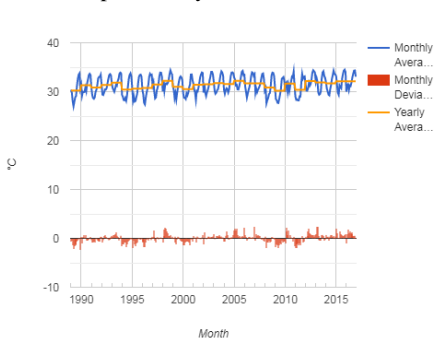
Caatinga portion of Semiard Ceara has 71% of land territory with declining productivity, an additional 14.5% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



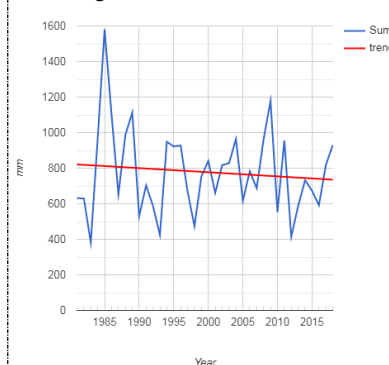
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2016



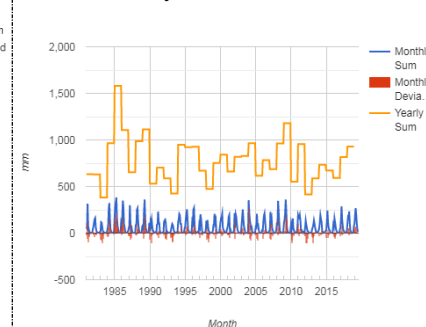
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



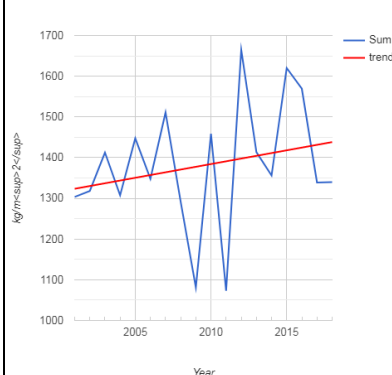
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



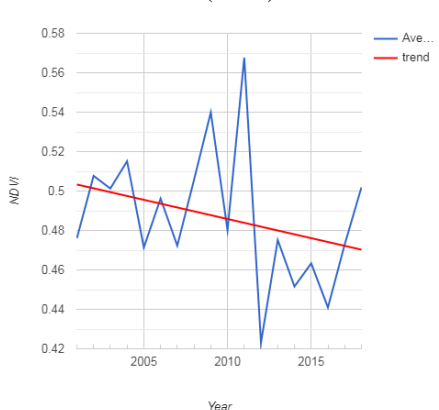
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



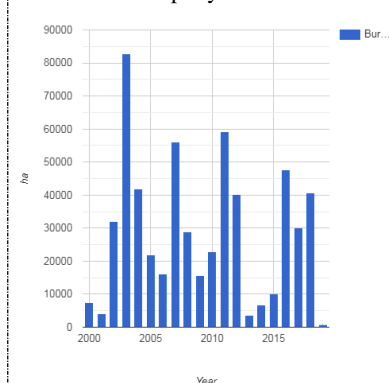
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



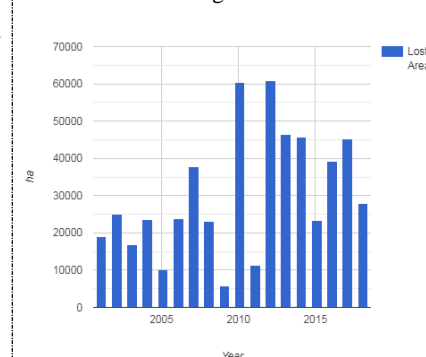
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018¹⁵⁰

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is extremely vulnerable to wildfire; highly vulnerable to droughts, river and coastal floods; and medium to high vulnerability to water scarcity, earthquakes, and extreme heat.¹⁵¹ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events and the potential reduction in tree cover could have a significant impact on soils (e.g. increased erosion).

150 Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

151 Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

RIO GRANDE DO NORTE

Precipitation

Average annual rainfall is approximately 671 mm / year decreasing by 46.14 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 162.29 mm while October presents the lowest average rainfall at 4.63 mm. Rainfall patterns are erratic with deviations ranging from -124.69 to 218.62 mm.

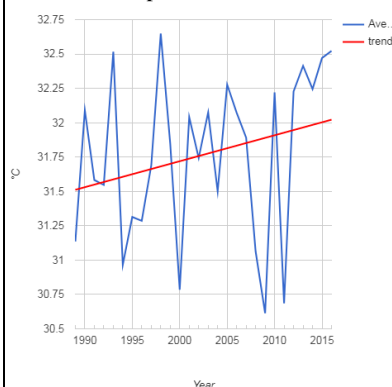
Temperatures

Average annual minimum temperature is 22.48°C, while maximum temperature is 32.02°C. For the period 1981 – 2016 November presents the highest average temperature at 33.52°C, while July was the lowest at 29.99°C ; minimum and maximum temperature have increased by 0.50°C and 0.51°C respectively.

Land Productivity Dynamics

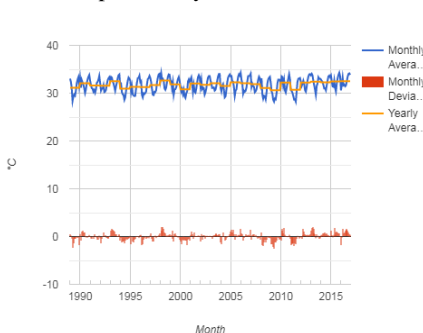
Caatinga portion of Semiard Rio Grande do Norte has 77% of land territory with declining productivity, an additional 6.82% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



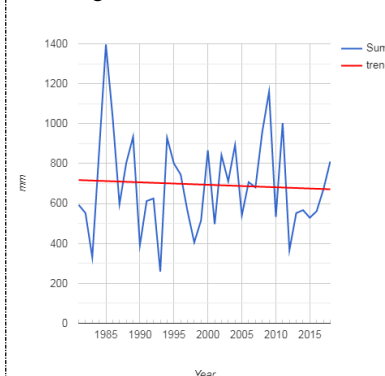
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2016



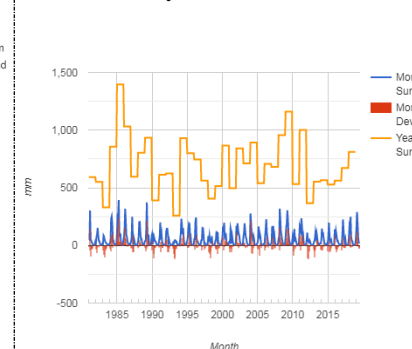
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



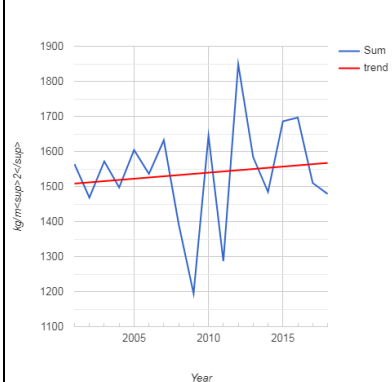
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



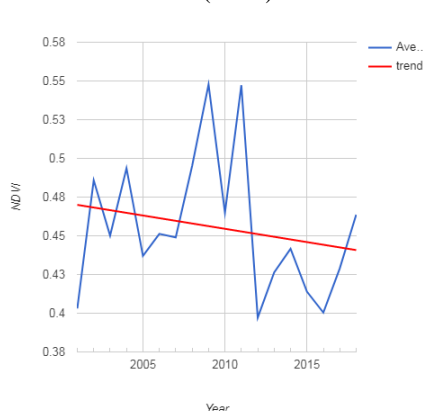
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



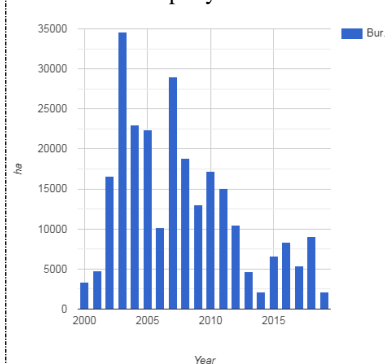
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



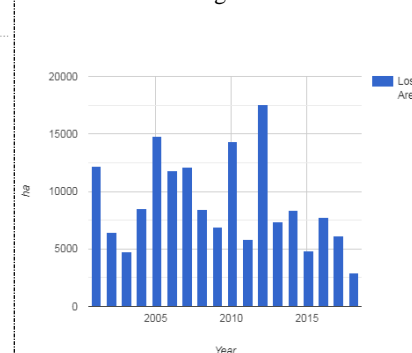
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018¹⁵²

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and wildfire; and medium to high vulnerability to water scarcity, earthquake, and extreme heat; and low to very low risk of cyclones and tsunamis.¹⁵³ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

152 Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

153 Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

PARAIBA

Precipitation

Average annual rainfall is approximately 693 mm / year decreasing by 4.69 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 155.83 mm while October presents the lowest average rainfall at 7.85 mm. Rainfall patterns are with deviations ranging from -99.98 to 249.23 mm.

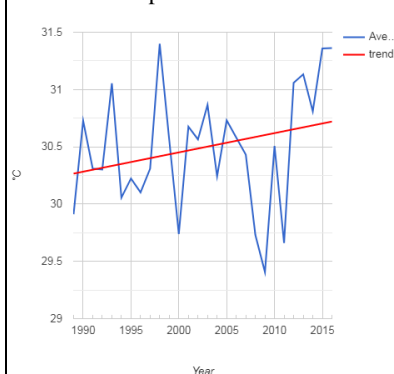
Temperatures

Average annual minimum temperature is 20.77°C, while maximum temperature is 30.72°C. For the period 1981 – 2016 December presents the highest average temperature at 32.175°C, while August was the lowest at 18.87°C ; minimum and maximum temperature have increased by 0.45°C and 0.45°C respectively.

Land Productivity Dynamics

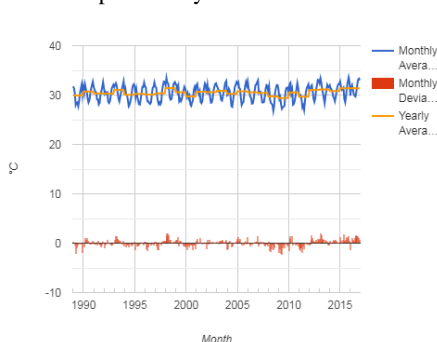
Caatinga portion of Semiard Paraiba has 80% of land territory with declining productivity, an additional 5.38% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



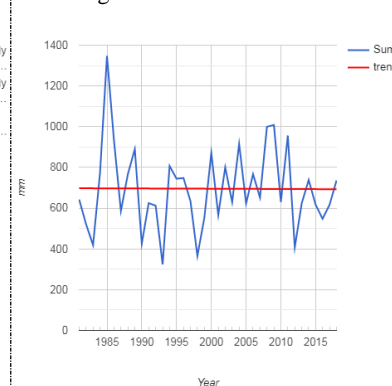
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2019



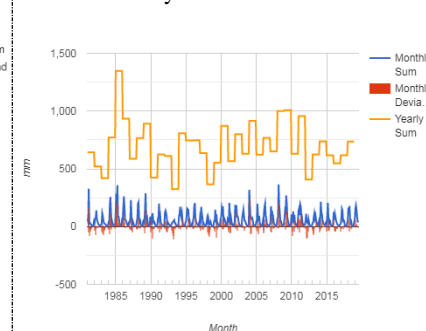
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



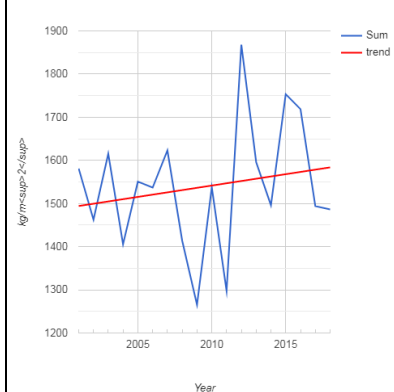
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



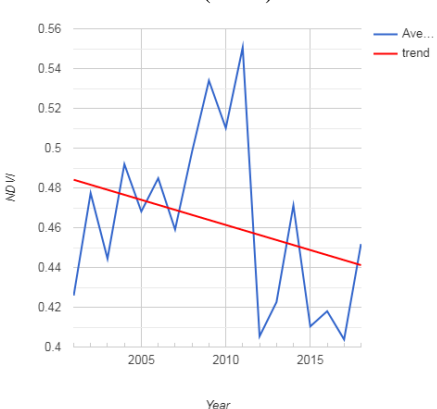
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



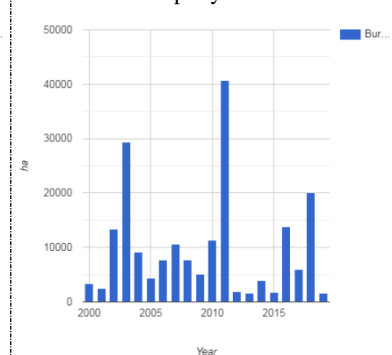
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



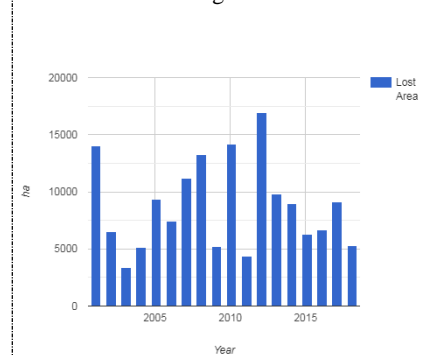
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018¹⁵⁴

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, and wildfire; and medium to high vulnerability to river floods, earthquakes, water scarcity and extreme heat.¹⁵⁵ Paraiba presents the smallest variations to date in temperature and precipitation, the region is nonetheless still at risk of decreased precipitation and increased temperature with potential negative impacts on the agricultural sector. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

154 Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

155 Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

PERNAMBUCO

Precipitation

Average annual rainfall is approximately 570 mm / year decreasing by 57.55 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 127.067 mm while September presents the lowest average rainfall at 9.06 mm. Rainfall patterns are erratic with deviations ranging from --100.67 to 255.82 mm.

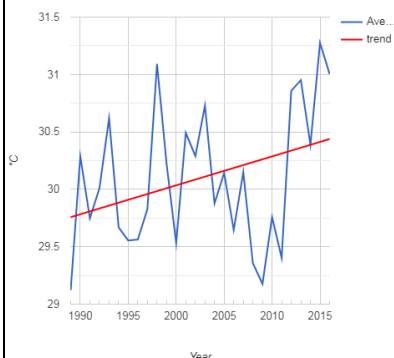
Temperatures

Average annual minimum temperature is 20.42°C, while maximum temperature is 30.44°C. For the period 1981 – 2016 November presents the highest average temperature at 32.38°C, while August was the lowest at 18.08°C ; minimum and maximum temperature have increased by 0.39°C and 0.68°C respectively.

Land Productivity Dynamics

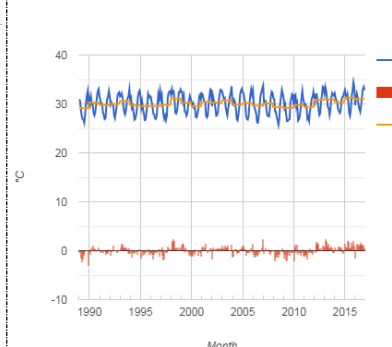
Caatinga portion of Semiard Pernambuco has 82% of land territory with declining productivity, an additional 8.89% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



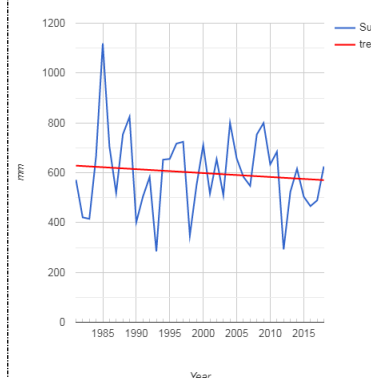
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2019



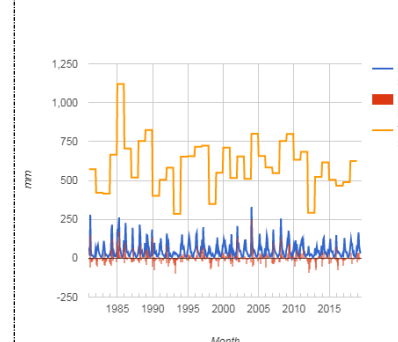
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



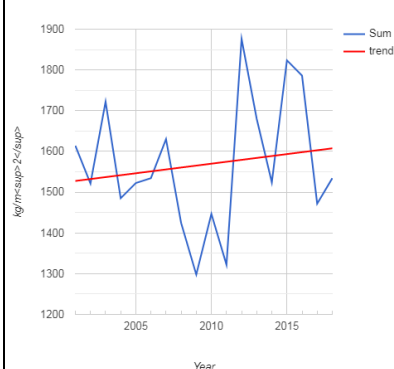
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



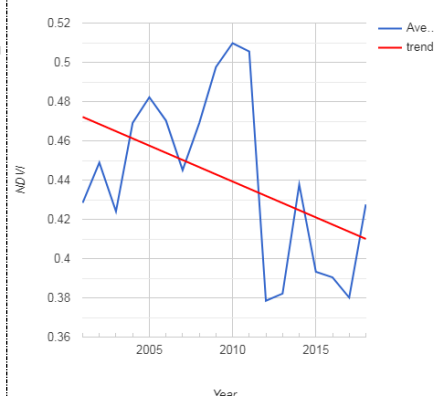
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



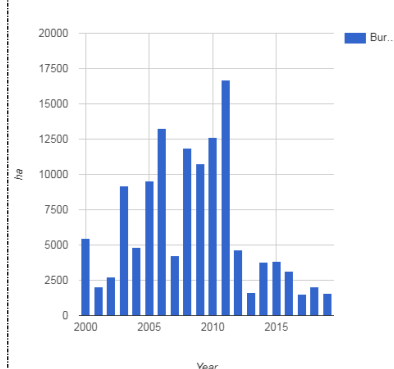
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



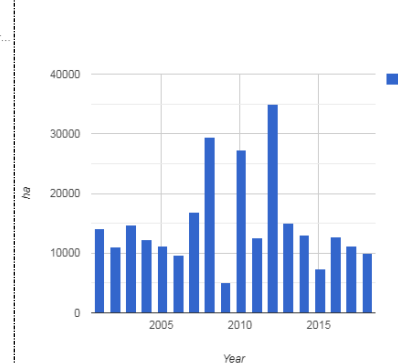
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018¹⁵⁶

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and wildfire; and medium to high vulnerability to water scarcity and extreme heat.¹⁵⁷ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

156 Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

157 Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

ALAGOAS

Precipitation

Average annual rainfall is approximately 673 mm / year decreasing by 60.98 mm since 1981. For the period 1981 – 2019, July has been the rainiest month on average with 116.74 mm while November presents the lowest average rainfall at 17.94 mm. Rainfall patterns are erratic with deviations ranging from -75.51 to 196.14 mm.

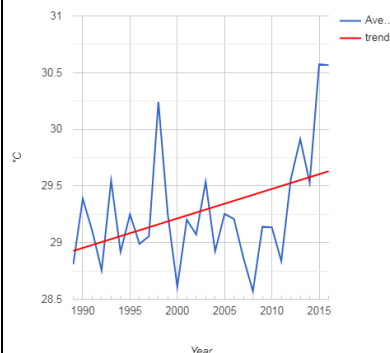
Temperatures

Average annual minimum temperature is 21.37°C, while maximum temperature is 29.63°C. For the period 1981 – 2016 December presents the highest average temperature at 31.82°C, while August was the lowest at 19.06°C ; minimum and maximum temperature have increased by 0.58°C and 0.70°C respectively.

Land Productivity Dynamics

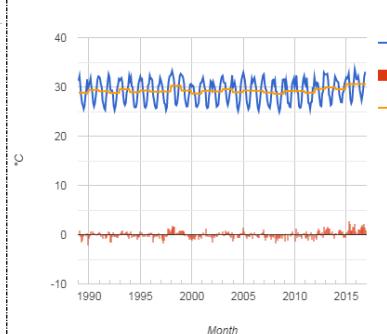
Caatinga portion of Semiard Alagoas has 64% of land territory with declining productivity, an additional 3.19% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



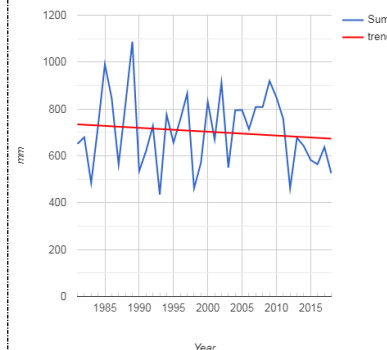
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2019



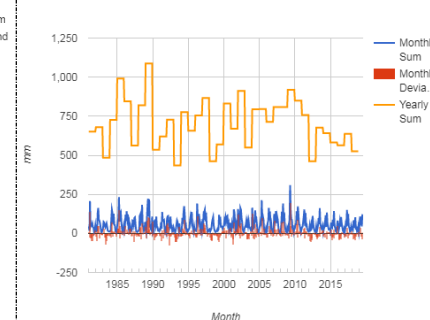
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



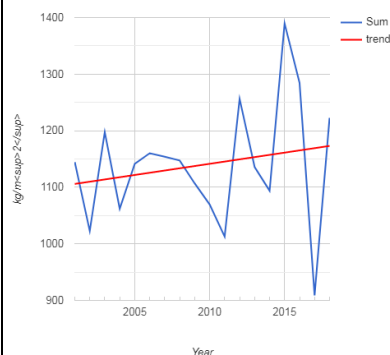
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



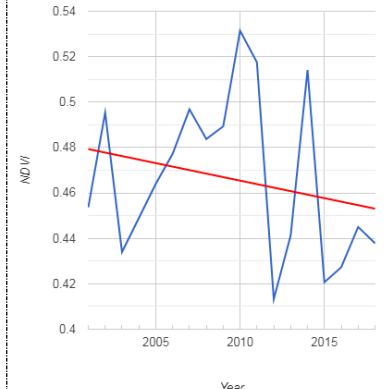
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



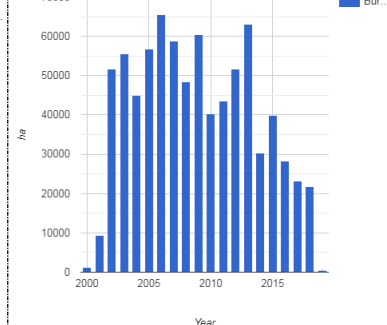
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



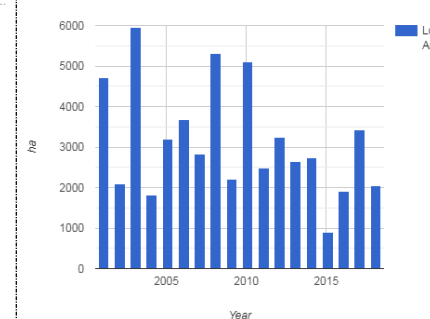
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018¹⁵⁸

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river and coastal floods, and wildfire; and medium to high vulnerability to water scarcity and extreme heat.¹⁵⁹ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

158 Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

159 Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

SERGIPE

Precipitation

Average annual rainfall is approximately 735 mm / year decreasing by 12.01 mm since 1981. For the period 1981 – 2019, June has been the rainiest month on average with 124.44 mm while October presents the lowest average rainfall at 29.097 mm. Rainfall patterns are erratic with deviations ranging from -68.27 to 185.09 mm.

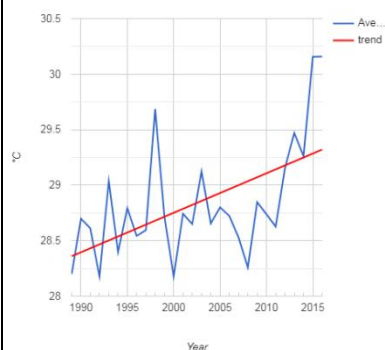
Temperatures

Average annual minimum temperature is 21.°C, while maximum temperature is 29.32°C. For the period 1981 – 2016 December presents the highest average temperature at 31.27°C, while August was the lowest at 19.03°C ; minimum and maximum temperature have increased by 1.01°C and 0.96°C respectively.

Land Productivity Dynamics

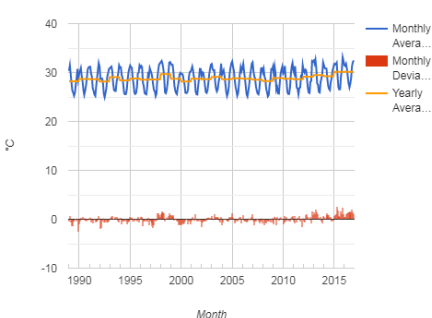
Caatinga portion of Semiard Sergipe has 71% of land territory with declining productivity, an additional 8.44% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



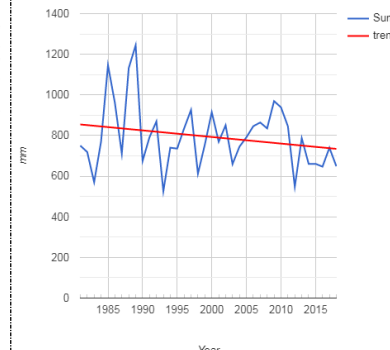
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2019



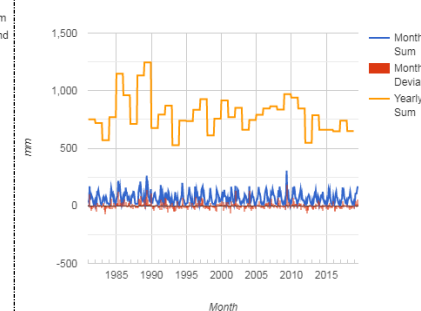
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



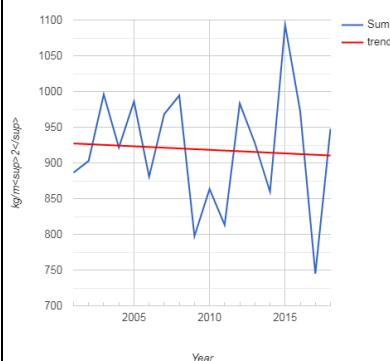
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



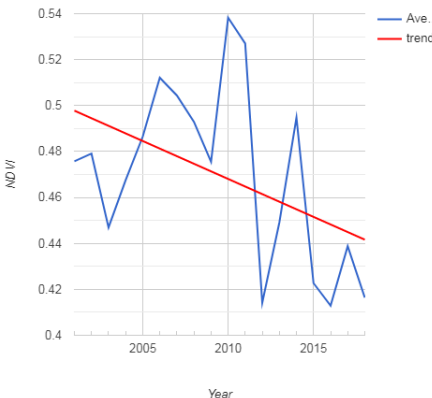
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



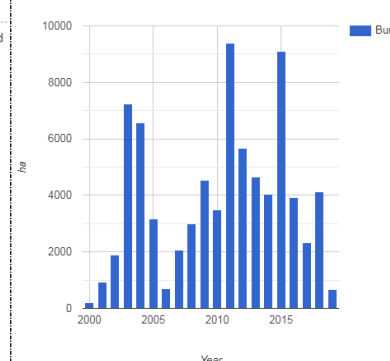
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



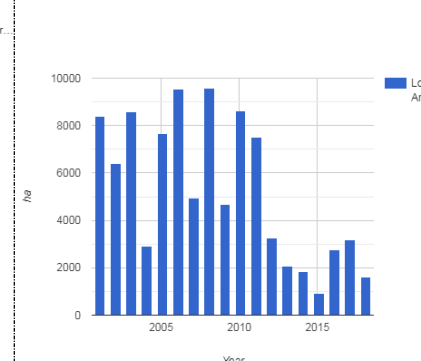
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018¹⁶⁰

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and wildfire; and medium to high vulnerability to coastal flooding, water scarcity and extreme heat.¹⁶¹ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

160 Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

161 Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

Appendix V

IFAD COMPLAINTS SUBMISSION FORM:



Investing in rural people

IFAD COMPLAINTS SUBMISSION FORM

FOR ALLEGED NON-COMPLIANCE WITH ITS SOCIAL AND ENVIRONMENTAL POLICIES AND MANDATORY ASPECTS OF ITS SOCIAL, ENVIRONMENTAL AND CLIMATE ASSESSMENT PROCEDURES (SECAP)

i) NATURE OF THE COMPLAINT

What complaint are you making to IFAD? (Choose the one(s) applicable to your complaint)

- ☐ Complaint relating to individuals/communities believing they are or may be adversely affected by an IFAD funded project
- ☐ Complaint relating to IFAD's failure to apply its Social and Environmental Policies
- ☐ Complaint relating to IFAD's failure to apply the Mandatory Aspects of SECAP
- ☐ Initiate the Impartial Review conducted by the Office of the Vice-President (OPV) if unsatisfied by the response from the IFAD Regional Division

ii) COMPLAINANTS' INFORMATION

a) How many Complainants are you? (You must be 2 in order for the Complaint to be admissible)

b) Are you nationals of the concerned country or living in the area? (Complainants must both be nationals of the country concerned and/or living in the project area)

☐ YES

☐ NO

iii) CONFIDENTIALITY

a) The identity of complainants will be kept confidential if they request so of IFAD.

b) Do you want your identity to be kept confidential?

☐ YES

☐ NO

c) If YES, Please state why. If NO, please avail your details below:

iv) COMPLAINANTS' INFORMATION

a) COMPLAINANT 1

FULL NAME:

TITLE:

ORGANISATION:

PHONE NUMBER (WITH COUNTRY CODE):

EMAIL:

LOCATION

YOUR ADDRESS/ LOCATION:

MAILING ADDRESS (IF DIFFERENT):

ADDITIONAL GUIDANCE ON HOW TO LOCATE YOU (IF APPLICABLE):

b) COMPLAINANT 2

FULL NAME:

TITLE:

ORGANISATION:

PHONE NUMBER (WITH COUNTRY CODE):

EMAIL:

LOCATION

YOUR ADDRESS/ LOCATION:

MAILING ADDRESS (IF DIFFERENT):

ADDITIONAL GUIDANCE ON HOW TO LOCATE YOU (IF APPLICABLE):

Please provide the names and/or description of other individuals or groups that support the complaint (If any):

First Name	Last Name	Title/Affiliation	Signature	Contact Information

If the space provided above is not enough, attach a separate document with a list of other individuals or groups (with their signatures) who support the complaint.

v) IFAD PROJECT/PROGRAMME OF CONCERN AND NATURE OF CONCERN

a) Which IFAD-supported project/programme are you concerned about? (if known):

b) Project/Programme name (if known):

c) Please provide a short description of your concerns about the project/programme. Please describe, as well, the types of Environmental and Social impacts that may occur, or have occurred, as a result.

d) When did the situation that raised your concerns start developing? (Complaints must concern projects/programmes currently under design/implementation. Complaints concerning projects/programmes that preceded the operationalization of SECAP in 1/1/2015, closed projects or those that are more than 95 per cent disbursed will not be considered)

vi) PROJECT LEVEL

a) Have you raised your complaint with government representatives or NGO(s) responsible for planning or executing the project or programme or the Lead Agency or any governmental body with the responsibility of overseeing the Lead Agency? (The complaint should first be brought to the above authorities. If they don't respond then the matter may be brought to IFAD's attention. The issue may be brought straight to IFAD if the complainants feel they may be subject to retaliation)

☐ YES

☐ NO

If YES,

First Name	Last Name	Title/Affiliation	Estimated Date of Contact	Nature of Communication	Response from the Individual

b) Please explain why, if the response or actions taken are not satisfactory.

c) How do you wish to see the complaint resolved? Do you have any other matters, evidence or facts (including supporting documents) that you would like to share?

vii) IMPARTIAL REVIEW BY THE OFFICE OF THE VICE PRESIDENT

a) Do you disagree with the response from the IFAD Regional Division in relation to your complaint?

☐ YES

☐ NO

b) Please provide the details of the response from the IFAD Regional Division in relation to your complaint

c) Please explain why, if the response or actions taken are not satisfactory.

d) How do you wish to see the complaint resolved?

e) Do you have any other matters or facts (including supporting documents) that you would like to share?

Signature and Date (1st Complainant)

Signature and Date (2nd Complainant)

The filled in form shall be returned to SECAPcomplaints@ifad.org

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex 6: First Annual Work Plan and Budget (AWPB)

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

For the elaboration of the first year AWPB, it was considered that all selected states would sign contract with BNDES gradually at the beginning of the first year. It would be unlikely that all contracts are signed simultaneously. In fact, the fulfillment of all applicable conditions to celebrate contracts will take a time that may vary from one state to the other. It is also important recalling that the selection of cities that will comprise each state intervention area will happen before the signature. This fundamental stage must be conducted in a very careful way to help achieve the project's objectives.

Considering these aspects, the necessary and possible activities to be implemented were defined, highlighting the elaboration of Territorial Resilience Investment Plans (TRIPs) as one of the main results of year one. TRIPs will define activities to be financed by components 1 and 2 throughout the project.

Component 1:

This component will concentrate the main Project activities during the first year. The first activity of this component will be the communities' selection (by group of four to form territorial units in municipalities). This activity will be conducted by technical assistance (TA) bodies as soon as they are hired.

Once communities are selected and organized in territories, TA teams will elaborate a Territorial Resilience Investment Plan (TRIPs). To assist the elaboration of TRIPs, local and regional exchange visits will take place. They will be organized and carried out by TA entities.

The purpose of these visits will be to discover innovations and activities that can be financed by TRIPs.

The elaboration of TRIPs as well as local and regional visits will be based on the results and products of the DAKI donation program, in particular, on the experiences of projects supported by IFAD in the Brazilian Northeast.

Component 2:

Since activities of this component depend on the conclusion of the elaboration of TRIPs, they will start from the second year on.

Component 3:

In the first year, some activities will start, such as: i) the acquisition of material for young communicators network, ii) the execution of general and specific preparatory studies for each state, iii) technical meetings at the regional and local levels, iv) hiring M&E and IT services, and v) holding technical meetings at the regional and local levels, related in particular with Component 1 activities, the elaboration of TRIPs and other transversal themes that investments will target and strengthen.

Project Management Unit (PMU):

Once contracts are signed between BNDES and each state, it will be possible to start some activities as: i) the constitution of Project Management Unit teams, ii) the preparation of each PMU's headquarter, iii) the acquisition of office supplies and vehicles.

AWPB year 1: Sintesis

	Total Project	Year 1	
		USD	% total budget
Component 1	82.472.786	107.497	0,13%
Component 2	111.142.137	0	0,00%
Component 3	9.441.911	454.087	4,81%
PMU	14.776.533	588.592	3,98%
Total	217.833.367	1.150.176	0,53%

AWPB year 1: Expenditure Account

	Expenditure Account 1	Expenditure Account 2	Total
Component 1	107.497	-	107.497
Component 2	-	-	-
Component 3	454.087	-	454.087
PMU	461.133	127.459	461.133
Total	1.022.716	127.459	1.150.176

Expenditure Account 1: Goods, Services, Works, and Grants

Expenditure Account 2: Management and Administrative Provision

Componente 1: Climate-Resilient Productive Systems (CRPS)

	Unit	Quantities	Unit Cost (US\$)	Total Cost	Exp. Account. /c	Month	Fin. Rule
A. Output 1. Territorial Resilience Investment Plans (TRIPs)							
1. Activity 1.1 Select project areas and develop TRIPs	Study	3	20.808	62.424	1	6 to 12	GOVT
B. Output 2. Household Resilient Investments							
1. Activity 2.1 Implement CRPS in family farms							
Climate resilient Investment (ISA Familia)	Number	-	1.024	-			GCFG (89.252%), BEN (10%)
TA for Climate Resilient Investment /a	Family/yr	-	189	-			IFAD2 (100%)
Subtotal				-			
2. Activity 2.2 Implement backyard gardens using CRPS							
Investment in Backyard garden (ISA Quintais) /b	Number	-	511	-			BEN (10%), GCFL (74.7%), GCFG (10.6%), IFAD (1.65%), IFAD2 (0.55%)
Subtotal				-			
C. Output 3. Collective resilient investments							
1. Activity 3.1 Implement Collective Areas Sustainable Management (CASM)							
Investment in Natural Resource Management (ISA coletivo)	Number	-	95.466	-			BEN (10%), GCFL (90%)
TA for Natural Resource Management	Family/yr	-	189	-			GOVT
Subtotal				-			
2. Activity 3.2 Implement CRPS in Schools							
Investment in Schools (ISA Escola)	Number	-	4.083	-			GCFL (90%), BEN (10%)
TA for Schools	School/yr	-	102	-			IFAD (45%), IFAD2 (55%)
Subtotal				-			
3. Activity 3.3 Test productive models of Bio saline agriculture							
Biosaline agriculture systems	System	-	20.270	-			IFAD (43%), IFAD2 (57%)
TA for Biosaline agriculture systems	Family/yr	-	115	-			IFAD (43%), IFAD2 (57%)
Subtotal				-			
Subtotal				-			
D. Output 4. Farmers and Entrepreneurship support							
1. Activity 4.1 Build a Farmers Network							
Training of farmer-trainers	N° trained	-	954	-			GOVT
Local exchange-visits	Participant	600	36	19.022	1	9 to 12	IFAD (50%), IFAD2 (50%)
Regional exchange-visits	Participant	300	98	26.051	1	9 to 12	IFAD (50%), IFAD2 (50%)

Workshops and trainings for Family farmers and Community Leaders	Participant	-	78	-	IFAD (50%), IFAD2 (50%)
Subtotal				45.073	
2. Activity 4.2 Promote local entrepreneurship					
Grants for micro-entreprises to develop Agroforestry suppliers	Number	-	12600	-	GCFG (100%)
TA for Micro-entreprises	Family/yr	-	944	-	GCFG (100%)
Subtotal				-	
Subtotal				45.073	
Total				107.497	

\a: 1 to 140 ratio

\b: Backyard gardens will be linked to production cisterns, to be supported with investment and TA under Component 2

\c: Expenditure Account 1: Goods, Services, Works, and Grants

Expenditure Account 2: Management and Administrative Provision

Component 2: Water access

	Unit	Quantities	Unit Cost (US\$)	Total Cost	Exp. Account	Month	Fin. Rule
A. Output 5. Water access technologies for harvesting, reuse, treatment and storage							
1. Activity 5.1 Build boardwalk cisterns for backyard gardens							
Cisterns /a	Number	-	3.583	-			BEN (10%), GCFL (39.7362%), IFAD2 (2.209%), IFAD (4.51%)
TA for Cisterns /b	Family/yr	-	217	-			GOVT
Subtotal				-			
2. Activity 5.2 Implement social technologies to increase water in the field							
Other social technology systems (small farm ponds and groundwater storage basins)	Number	-	1.781	-			BEN (10%), IFAD2 (70%)
TA for Other social technology systems	Family/yr	-	217	-			GOVT
Subtotal				-			
3. Activity 5.3 Implement treatment and reuse systems for household wastewater							
Re-use grey and black water systems /c	Number	-	1.330	-			BEN (10%), GCFL (70%), IFAD (20%)
TA for Re-use grey and black water systems	Family/yr	-	217	-			GOVT
Re-use grey and black water- training for trainers and exchanges	Lumpsum			-			IFAD (80%)
Subtotal				-			
Total				-			

\a 52.000lts- Cisterna Calçada, Enxurrada, etc.

\b Estimated at 2 years of TA per family that builds a cistern

\c Sistemas de Reuso de aguas cinzas / Fossa verde

Component 3: Knowledge management and scaling-up

	Unit	Quantities	Unit Cost (US\$)	Total Cost	Exp. Account	Month	Fin. Rule
A. Output 6. Capacity and awareness building							
1. Activity 6.1. Develop a young communicators network							
Workshops for young communicators /a	Events	-	4,05	-			GOVT
Inter-state exchange visits /b	Events	-	6,76	-			GOVT
Inter-regional exchange visits /c	Events	-	2,70	-			GOVT
Trainings for youths /d	Events	-	4,00	-			GOVT
Learning scholarships for youths	Youth	-	1,62	-			GOVT
Smartphones and equipments for young communicators	Youth	414	0,32	139.695	1	9 to 12	GOVT
Laptops for youths	Number	6	0,95	5.905	1	9 to 12	GOVT
Handbooks and other communication material	Number	-	12,16	-			GOVT
Illustrated handbooks and guidelines	Number	-	9,54	-			GOVT
Newsletters and bulletins	Number	-	0,95	-			GOVT
Multimedia material / Videos	Number	-	13,51	-			GOVT
Communication Equipment /e	Lumpsum/Office	12	2,46	30.706	1	9 to 12	GOVT
Subtotal				176.306			
2. Activity 6.2. Strengthen capacity for women, youth, and trad. Communities							
Trainings for Women on sustainable technologies /f	Number	-	0,97	-			GOVT
Workshops and meetings for Women /g	Number	-	0,97	-			GOVT
Exchange visits for women /h	Number	-	3,41	-			GOVT
Training for TA in Gender approach, race and ethnicity /i	Number	-	4,05	-			GOVT
Case studies in traditional communities	Number	-	18,92	-			GOVT
Childcare support activities	Lumpsum			-			GOVT
Subtotal				-			
Subtotal				176.306			
B. Output 7. Scaling-up and sharing							
1. Activity 7.1 Promote south-south cooperation							
National Learning Route / Exchange-Visit /j	Events	-	25.829,90	-			GCFG (100%)
International Learning Route / Exchange visit (LAC) /k	Events	-	69.132,97	-			GCFG (100%)
International Learning Route / Exchange Visit (Africa)	Events	-	91.726,88	-			GCFG (100%)
Subtotal				-			
2. Activity 7.2 Facilitate discussions to unlock policy barriers							
Legal studies	Number	1	23.966,20	20.808	1	6 to 12	GCFG (100%)
Forums and Meetings at the federal level	Events	-	5.279,43	-			GCFG (100%)
Technical Meetings at the regional and local level	Events	5	2.611,02	11.248	1	6 to 12	GCFG (100%)

Gender Forum at the sub-project level	Events	-	2.639,72	-				GCFG (100%)
Consultant / Advisor	person-month	-	2.637,01	-				GCFG (100%)
Subtotal				32.056				
3. Activity 7.3 Experimentation of a CRPS participatory monitoring model /I	Events	-	2.654,30	-				GOVT
Subtotal				32.056				
C. Output 8. Planning and M&E, workshops and trainings								
1. Activity 8.1 Planning, M&E and KM at national level								
Knowledge Management- Information Platform /m	Lumpsum	-	15.394,93	-				GCFG (100%)
Operating services	lumpsum			24.515	1	6 to 12		GCFG (100%)
Baseline and Impact Evaluation surveys /n	Number	-	275.750,04	-				GCFG (100%)
Mid-term Evaluation	Number	-	121.712,08	-				GCFG (100%)
GIS Evaluations	Number	-	9.187,10	-				GCFG (100%)
Planning and Communication Services	lumpsum	1	17.575,02	15.259	1	6 to 12		GCFG (100%)
IT and management inputs and services	lumpsum			95.225	1	6 to 12		GCFG (100%)
IT Services	lumpsum/yr	1	17.575,02	15.259	1	6 to 12		GCFG (100%)
M&E Services	lumpsum	1	17.575,02	15.259	1	6 to 12		GCFG (100%)
Project Completion Report	Number	-	25.901,81	-				GCFG (100%)
M&E Meetings /o	Number	-	4.619,50	-				GCFG (100%)
Planning Workshops	Number	-	4.619,50	-				GCFG (100%)
Studies, Sistematizations and other KM products	Number	-	3.360,47	-				GCFG (100%)
Subtotal				165.517				
2. Activity 8.2 Planning, M&E and KM at state level								
Studies, Sistematizations and other KM products	Number	-	3.364,91	-				IFAD2 (100%)
Planning Workshops	Number	-	4.619,50	-				IFAD (100%)
Territorial Comitee Meetings	Number	-	2.308,28	-				IFAD (100%)
M&E Meetings /p	Number	-	4.619,50	-				IFAD (100%)
State-specific studies	Number	3	31.007,80	80.209		6 to 12		IFAD (52.9%), IFAD2 (47.1%)
Subtotal				80.209				
Subtotal				245.726				
Total				454.087				

Component 4: Project Management Unit

	Unit	Quantities	Unit Cost (US\$)	Total Cost	Exp. Account	Month	Fin. Rule
I. Investment Costs*							
A. Civil Works							
Refurbishment of Regional and Local PMU Offices /a	Lumpsum/office	3	14.778	42.178	1	6 to 12	GOVT
B. Goods, services and inputs							
1. Inputs and equipments							
Laptops /b	Number	87	640	54.309	1	6 to 12	GOVT
Smartphones /c	Number	87	268	22.719	1	6 to 12	GOVT
Printers /d	Number	20	230	4.499	1	6 to 12	GOVT
Vehicles and transportation /e	Number	12	28.119	337.427	1	6 to 12	GOVT
Subtotal				418.954			
2. Workshops and trainings for PMU Staff	Events	-	3.341	-			GOVT
3. Consultancies and studies							
Audits	Number	-	34.077	-			GCFG (100%)
Subtotal				418.954			
Total Investment Costs				461.133			
II. Recurrent Costs							
A. Salaries							
1. State Level							
Project Manager	Pers.month	18	1.892	34.054	2	6 to 12	GOVT
Project Assistant	Pers.month	18	730	13.135	2	6 to 12	GOVT
Procurement Specialist	Pers.month	-	1.622	-			GOVT
Accountant Specialist	Pers.month	-	1.622	-			GOVT
Technical Analysts	Pers.month	-	1.081	-			GOVT
Financial Management Specialist	Pers.month	18	1.622	29.189	2	6 to 12	GOVT
Agroforestry and Resilient Production Specialist	Pers.month	-	1.622	-			GOVT
Youth, Gender and traditional communities Specialist	Pers.month	-	1.622	-			GOVT
Communication and Knowledge Management Specialist	Pers.month	-	1.622	-			GOVT

M&E Specialist /f	Pers.month	18	1.622	29.189	2	6 to 12	GOVT
M&E Analyst	Pers.month	18	1.216	21.892	2	6 to 12	GOVT
Subtotal				127.459			
2. Field team							
Local PMU Supervisor	Pers.month	-	1.622	-			GOVT
Agroforestry and Resilient Production Specialist	Pers.month	-	1.351	-			GOVT
M&E Specialist	Pers.month	-	1.216	-			GOVT
Communication and KM Specialist	Pers.month	-	1.216	-			GOVT
Youth, gender and traditional communities specialist	Pers.month	-	1.216	-			GOVT
Subtotal				-			
Subtotal				127.459			
B. Operating Costs at State and Local level							
Travel expenses	Office/Month	-	3.994	-			GOVT
Transportation maintenance	Unit	-	2.672	-			GOVT
Transportation Insurance	Unit	-	3.395	-			GOVT
Office operating expenses	Office/month	-	1.985	-			GOVT
Services and Utilities	Office/Month	-	2.662	-			GOVT
Subtotal				-			
Total Recurrent Costs				127.459			
Total				588.592			

\a 12 Offices with different needs during the first 4 years

\b 1 laptop per PMU staff, and 25% replaced in Yr4

\c 1 smartphone per PMU staff, and 25% replaced in Yr4

\d 1 for 4 and 1/4 recycling in yr 4

\e 1 for each PMU office- recycling in yr 4

\f Including Planning

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex 7: Procurement Plan for first 18 months

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

Procurement Plan SUMMARY				
Country:	Brazil			
Project Name:	Planting Climate Resilience in Rural Communities of the Northeast (PCRP)			
Project ID:	2000002253			
Version	1.4			
Version Date	23-Jul-20			
Prepared by:	Frederico Lacerda (COA)			
Approved by:	Claus Reiner (Country Director)			
Procurement Category	Plan		Actual	
Currency	USD	LCU	USD	LCU
Goods	651 581.00	-	-	-
Works	42 178.00	-	-	-
Consulting Services	676 379.00	-	-	-
TOTAL	1 370 138.00	-	-	-

Prior Review Thresholds					
Thresholds	Goods	Works	Non-Consulting Services	Firms - Consulting Services	Individuals - Consulting Services
Prior Review	≥ US\$ 200,000.00	≥ US\$ 200,000.00	≥ US\$ 100,000.00	≥ US\$ 100,000.00	≥ US\$ 50,000.00

All Direct Contracting and Single-Source Procurements are **Prior Review** (in alignment with IFAD Procurement Handbook).

Procurement Method Thresholds			
	Shopping	NCB	ICB
Goods	< US\$ 100,000.00	≥ US\$ 100,000.00 to ≤ US\$ 200,000.00	> US\$ 200,000.00
Works	< US\$ 100,000.00	≥ US\$ 100,000.00 to ≤ US\$ 200,000.00	> US\$ 200,000.00
Non-Consulting Services	< US\$ 100,000.00	≥ US\$ 100,000.00 to ≤ US\$ 200,000.00	> US\$ 200,000.00
	ICS/CQS	LCS	QCBS
Individuals	< US\$ 50.00	≥ US\$ 50,000.00 to ≤ US\$ 100,000.00	> US\$ 100,000.00
Firms	< US\$ 50.00	≥ US\$ 50,000.00 to ≤ US\$ 100,000.00	> US\$ 100,000.00

Procurement Plan - Goods

Brazil

Planting Climate Resilience in Rural Communities of the Northeast (PCRP)

Project ID: 2000002253

Prepared by: Frederico Lacerda (COA)

Approved by: Claus Reiner (Country Director)

Total Amount

USD	LCU	
651 581.00	0.00	Plan
#REF!	#REF!	Actual

Version	1.4	23-Jul-20	Basic Data											Pre-Qualification					
AWPB/Component Ref	№	Description	Funding	Lot №/Description	Project Area	Plan vs. Actual	Pre-or Post Qualification	Prior or Post Review	Procurement Method	Envelopes	Amount (USD)	Amount (LCU)	Plan vs. Actual	Submission of PreQual Docs	No Objection Date	PreQual Invitation Date	PreQual Closing Date	Submission of PreQual Report	No Objection Date
AWPB Y1 C1	1	Logistics for local exchange-visits	IFAD	N/A	N/A	Plan	Post-Qual	Post Review	NS	1	19 022.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A
						Actual					#REF!	#REF!	Actual						
AWPB Y1 C1	2	Logistics for regional exchange-visits	IFAD	N/A	N/A	Plan	Post-Qual	Post Review	NS	1	26 051.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A
						Actual					#REF!	#REF!	Actual						
AWPB Y1 C3	3	Smartphones and equipments for young communicators	GOVT	N/A	N/A	Plan	Post-Qual	Prior Review	NS	1	139 695.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A
						Actual					#REF!	#REF!	Actual						
AWPB Y1 C3	4	Laptops for youths	GOVT	N/A	N/A	Plan	Post-Qual	Post Review	NS	1	5 905.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A
						Actual					#REF!	#REF!	Actual						
AWPB Y1 C3	5	Communication Equipment /e	GOVT	N/A	N/A	Plan	Post-Qual	Post Review	NS	1	30 706.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A
						Actual					#REF!	#REF!	Actual						
AWPB Y1 C3	6	Logistics for for technical meetings at the regional and local level	GOVT	N/A	N/A	Plan	Post-Qual	Post Review	NS	1	11 248.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A
						Actual					#REF!	#REF!	Actual						
AWPB Y1 C4	7	Laptops /b	GOVT	N/A	PMU	Plan	Post-Qual	Post Review	NS	1	54 309.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A
						Actual					#REF!	#REF!	Actual						
AWPB Y1 C4	8	Smarphones /c	GOVT	N/A	PMU	Plan	Post-Qual	Post Review	NS	1	22 719.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A
						Actual					#REF!	#REF!	Actual						
AWPB Y1 C4	9	Printers /d	GOVT	N/A	PMU	Plan	Post-Qual	Post Review	NS	1	4 499.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A
						Actual					#REF!	#REF!	Actual						
AWPB Y1 C4	10	Vehicles and transportation /e	GOVT	N/A	PMU	Plan	Pre-Qual	Prior Review	NCB	1	337 427.00		Plan	21-Mar-22	28-Mar-22	30-Mar-22	29-Apr-22	13-May-22	20-May-22
						Actual					#REF!	#REF!	Actual						

Procurement Plan - Goods

Brazil

Planting Climate Resilience in Rural Communities of 1

Project ID: 2000002253

Prepared by: Frederico Lacerda (COA)

Approved by: Claus Reiner (Country Director)

Procurement Methods

NS: National Shopping
IS: International Shopping
NCB: National Competitive Bidding
ICB: International Competitive Bidding
LIB: Limited (International) Bidding
DC: Direct Contracting

Version	1.4	23-Jul-20	Bidding Process				Bid Evaluation					Contract Award & Signature		
AWPB/Component Ref	Nº	Description	Submission of BD	No-objection Date	Bid Invitation Date	Bid Closing-Opening	Submission Tech Eval Rpt	No-objection Date	Submission Combined Eval Rpt*	No-objection Date	Plan vs. Actual	Issue of NOIT&Standstill	Date Contract Award	Date Contract Signature
AWPB Y1 C1	1	Logistics for local exchange-visits	25-Jul-22	N/A	26-Jul-22	9-Aug-22	N/A	N/A	16-Aug-22	N/A	Plan	16-Aug-22	18-Aug-22	20-Aug-22
											Actual			
AWPB Y1 C1	2	Logistics for regional exchange-visits	25-Jul-22	N/A	26-Jul-22	9-Aug-22	N/A	N/A	16-Aug-22	N/A	Plan	16-Aug-22	18-Aug-22	20-Aug-22
											Actual			
AWPB Y1 C3	3	Smartphones and equipments for young communicators	11-Jul-22	18-Jul-22	19-Jul-22	2-Aug-22	N/A	N/A	9-Aug-22	16-Aug-22	Plan	16-Aug-22	18-Aug-22	20-Aug-22
											Actual			
AWPB Y1 C3	4	Laptops for youths	25-Jul-22	N/A	26-Jul-22	9-Aug-22	N/A	N/A	16-Aug-22	N/A	Plan	16-Aug-22	18-Aug-22	20-Aug-22
											Actual			
AWPB Y1 C3	5	Communication Equipment /e	25-Jul-22	N/A	26-Jul-22	9-Aug-22	N/A	N/A	16-Aug-22	N/A	Plan	16-Aug-22	18-Aug-22	20-Aug-22
											Actual			
AWPB Y1 C3	6	Logistics for for technical meetings at the regional and local level	25-Jul-22	N/A	26-Jul-22	9-Aug-22	N/A	N/A	16-Aug-22	N/A	Plan	16-Aug-22	18-Aug-22	20-Aug-22
											Actual			
AWPB Y1 C4	7	Laptops /b	25-Jul-22	N/A	26-Jul-22	9-Aug-22	N/A	N/A	16-Aug-22	N/A	Plan	16-Aug-22	18-Aug-22	20-Aug-22
											Actual			
AWPB Y1 C4	8	Smarphones /c	25-Jul-22	N/A	26-Jul-22	9-Aug-22	N/A	N/A	16-Aug-22	N/A	Plan	16-Aug-22	18-Aug-22	20-Aug-22
											Actual			
AWPB Y1 C4	9	Printers /d	25-Jul-22	N/A	26-Jul-22	9-Aug-22	N/A	N/A	16-Aug-22	N/A	Plan	16-Aug-22	18-Aug-22	20-Aug-22
											Actual			
AWPB Y1 C4	10	Vehicles and transportation /e	30-May-22	6-Jun-22	8-Jun-22	23-Jul-22	N/A	N/A	6-Aug-22	13-Aug-22	Plan	25-Aug-22	30-Aug-22	1-Sep-22
											Actual			

Procurement Plan - Goods

Brazil

Planting Climate Resilience in Rural Communities of the Northeast (PCRP)

Project ID: 2000002253

Prepared by: Frederico Lacerda (COA)

Approved by: Claus Reiner (Country Director)

Total Amount

USD	LCU	
42 178.00	0.00	Plan
#REF!	#REF!	Actual

Version1.423-Jul-20			Basic Data										
AWPB/Component Ref	Nº	Description	Funding	Lot Nº/Description	Project Area	Plan vs. Actual	Pre-or Post Qualification	Prior or Post Review	Procurement Method	Envelopes	Amount (USD)	Amount (LCU)	Plan vs. Actual
AWPB Y1 C4	1	Refurbishment of Regional and Local PMU Offices /a	GOVT	N/A	PMU	Plan	Post-Qual	Post Review	NS	1	42 178.00		Plan
						Actual					#REF!	#REF!	Actual

Procurement Plan - Goods

Brazil

Planting Climate Resilience in Rural Communities of the

Project ID: 2000002253

Prepared by: Frederico Lacerda (COA)

Approved by: Claus Reiner (Country Director)

Version1.423-Jul-20			Pre-Qualification						Bidding Process				
AWPB/Component Ref	No	Description	Submission of PreQual Docs	No Objection Date	PreQual Invitation Date	PreQual Closing Date	Submission of PreQual Report	No Objection Date	Submission of BD	No-objection Date	Bid Invitation Date	Bid Closing-Opening	Submission Tech Eval Rpt
AWPB Y1 C4	1	Refurbishment of Regional and Local PMU Offices /a	N/A	N/A	N/A	N/A	N/A	N/A	10-Jan-22	N/A	11-Jan-22	25-Jan-22	N/A

Procurement Plan - Goods

Brazil

Planting Climate Resilience in Rural Communities of the

Project ID: 2000002253

Prepared by: Frederico Lacerda (COA)

Approved by: Claus Reiner (Country Director)

Procurement Methods

NS: National Shopping
IS: International Shopping
NCB: National Competitive Bidding
ICB: International Competitive Bidding
LIB: Limited (International) Bidding
DC: Direct Contracting

Version 1.4 23-Jul-20			Bid Evaluation				Contract Award & Signature		
AWPB/Component Ref	No	Description	No-objection Date	Submission Combined Eval Rpt*	No-objection Date	Plan vs. Actual	Issue of NOITA&Standstill	Date Contract Award	Date Contract Signature
AWPB Y1 C4	1	Refurbishment of Regional and Local PMU Offices /a	N/A	1-Feb-22	N/A	Plan	1-Feb-22	3-Feb-22	5-Feb-22

Procurement Plan - Consulting

Brazil

Planting Climate Resilience in Rural Communities of the Northeast (PCRP)

Project ID: 2000002253

Prepared by: Frederico Lacerda (CDA)

Approved by: Claus Reimer (Country Director)

Total Amount

USD

LCU

676 379.00	0.00	Plan
#REF!	#REF!	Actual

Selection Methods
OCBS: Quality and Cost-Based Selection
CQS: Quality-Based Selection
CQS: Selection by Consultant's Qualifications
LCS: Least-Cost Selection
FBS: Fixed Budget Selection
ICS: Individual Consultants Selection
SSS: Sole Source Selection

1.4		23-Jul-20		Basic Data								EDI Shortlist Procedure						Proposal Process				Evaluation					Contract Award & Signature					
Item/Comment Ref	No	Description*	Funding	Project Area	Plan vs. Actual	Shortlist (Yes/No)	Prior or Post Review	Procurement Method	Amount (USD)	Amount (LCU)	Plan vs. Actual	Submission of RFP	No Objection Date	RFI Launch Date	EOI Submission Deadline	Submission of Shortlist Report	No Objection Date	Submission of RFP/RFQ	No objection Date	RFP/RFQ Launch Date	Proposal submission deadline	Submission of TBR	No objection Date	Submission of CBR	No objection Date	Plan vs. Actual	Issue of NOTA&StandardB	Negotiations completed	Submission of Draft Contract and MOU	No objection Date	Date Contract Award	Date Contract Signature
AWPB Y1 C1	1	Studies to select project areas and TRPs	GOVT	N/A	Plan				62 424.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	10-Jan-22	N/A	12-Jan-22	2-Feb-22	16-Feb-22	N/A	N/A	N/A	Plan	28-Feb-22	14-Mar-22	18-Mar-22	N/A	20-Mar-22	27-Mar-22
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C3	2	Legal studies	GCF	N/A	Plan	Yes	Post Review	ICS	20 808.00		Plan	7-Feb-22	N/A	9-Feb-22	2-Mar-22	16-Mar-22	N/A	20-Mar-22	N/A	22-Mar-22	13-Apr-22	26-Apr-22	N/A	N/A	N/A	Plan	8-May-22	22-May-22	26-May-22	N/A	28-May-22	4-Jun-22
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C3	3	Operating services	GCF	N/A	Plan	No	Post Review	OCBS	24 515.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	21-Mar-22	N/A	23-Mar-22	7-May-22	21-May-22	N/A	4-Jun-22	N/A	Plan	16-Jun-22	7-Jul-22	11-Jul-22	N/A	13-Jul-22	20-Jul-22
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C3	4	Planning and Communication Services	GCF	N/A	Plan	No	Post Review	OCBS	15 259.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	21-Mar-22	N/A	23-Mar-22	7-May-22	21-May-22	N/A	4-Jun-22	N/A	Plan	16-Jun-22	7-Jul-22	11-Jul-22	N/A	13-Jul-22	20-Jul-22
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C3	5	IT and management inputs and services	GCF	N/A	Plan	No	Post Review	OCBS	95 225.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	21-Mar-22	N/A	23-Mar-22	7-May-22	21-May-22	N/A	4-Jun-22	N/A	Plan	16-Jun-22	7-Jul-22	11-Jul-22	N/A	13-Jul-22	20-Jul-22
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C3	6	IT Services	GCF	N/A	Plan	No	Post Review	OCBS	15 259.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	21-Mar-22	N/A	23-Mar-22	7-May-22	21-May-22	N/A	4-Jun-22	N/A	Plan	16-Jun-22	7-Jul-22	11-Jul-22	N/A	13-Jul-22	20-Jul-22
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C3	7	M&EE Services	GCF	N/A	Plan	No	Post Review	OCBS	15 259.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	21-Mar-22	N/A	23-Mar-22	7-May-22	21-May-22	N/A	4-Jun-22	N/A	Plan	16-Jun-22	7-Jul-22	11-Jul-22	N/A	13-Jul-22	20-Jul-22
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C3	8	State-specific studies	IFAD	N/A	Plan	Yes	Prior Review	ICS	80 209.00		Plan	7-Feb-22	14-Feb-22	16-Feb-22	9-Mar-22	23-Mar-22	30-Mar-22	3-Apr-22	10-Apr-22	12-Apr-22	3-May-22	17-May-22	24-May-22	N/A	N/A	Plan	5-Jun-22	19-Jun-22	23-Jun-22	30-Jun-22	2-Jul-22	9-Jul-22
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C4	9	Project Manager	GOVT	PMU	Plan	No	Post Review	ICS	68 112.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	1-Oct-21	N/A	3-Oct-21	24-Oct-21	7-Nov-21	N/A	N/A	N/A	Plan	19-Nov-21	3-Dec-21	7-Dec-21	N/A	9-Dec-21	16-Dec-21
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C4	10	Project Assistant	GOVT	PMU	Plan	No	Post Review	ICS	26 280.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	1-Oct-21	N/A	3-Oct-21	24-Oct-21	7-Nov-21	N/A	N/A	N/A	Plan	19-Nov-21	3-Dec-21	7-Dec-21	N/A	9-Dec-21	16-Dec-21
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C4	11	Procurement Specialist	GOVT	PMU	Plan	Yes	Post Review	ICS	58 392.00		Plan	N/A	N/A				N/A	1-Oct-21	N/A	3-Oct-21	24-Oct-21	7-Nov-21	N/A	N/A	N/A	Plan	19-Nov-21	3-Dec-21	7-Dec-21	N/A	9-Dec-21	16-Dec-21
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C4	12	Financial Management Specialist	GOVT	PMU	Plan	No	Post Review	ICS	58 392.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	1-Oct-21	N/A	3-Oct-21	24-Oct-21	7-Nov-21	N/A	N/A	N/A	Plan	19-Nov-21	3-Dec-21	7-Dec-21	N/A	9-Dec-21	16-Dec-21
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C4	13	M&EE Specialist	GOVT	PMU	Plan	No	Prior Review		58 392.00		Plan	N/A	N/A	9-Feb-22	2-Mar-22	16-Mar-22	N/A	1-Oct-21	N/A	22-Mar-22	12-Apr-22	26-Apr-22	N/A	N/A	N/A	Plan	8-May-22	22-May-22	26-May-22	N/A	28-May-22	4-Jun-22
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y1 C4	14	M&EE Analyst	GOVT	PMU	Plan	No	Post Review	ICS	43 776.00		Plan	N/A	N/A	N/A	N/A	N/A	N/A	1-Oct-21	N/A	3-Oct-21	24-Oct-21	7-Nov-21	N/A	N/A	N/A	Plan	19-Nov-21	3-Dec-21	7-Dec-21	N/A	9-Dec-21	16-Dec-21
				Actual					#REF!	#REF!	Actual															Actual						
AWPB Y2 C4	15	Audit	GCF	PMU	Plan	Yes	Post Review	ICS	34 077.00		Plan	24-Jan-22	N/A	26-Jan-22	16-Feb-22	2-Mar-22	N/A	6-Mar-22	N/A	8-Mar-22	29-Mar-22	12-Apr-22	N/A	N/A	N/A	Plan	24-Apr-22	8-May-22	12-May-22	N/A	14-May-22	21-May-22
				Actual					#REF!	#REF!	Actual															Actual						

Day Ranges

These tables provide estimated timelines by procurement methods, based on experience and guidance in the Procurement Handbook where specified. The approximate number of days are used in the default Procurement Plan Formulas. Timelines in the Approx fields/Formulas are not prescriptive, and may be modified by the project. Approx figures entered will be highlighted/flagged, if below the Minimum number of days. Zero indicates steps that are not applicable to the method, and are indicated as N/A in the Formulas.

Goods & Works

[illegible]

Services

[illegible]

NOTE

1. Some procurement methods for low-value processes might require No Objections based on the Prior Review Thresholds. Where they do not require, No Objection number of days should be zero

2. **RFP:** Request for Proposals: standard procurement document used for Services

3. **RCQ:** Requests for Consultants Qualifications: Procurement document used for CQS and LCS. The RFP is used for all other procurement methods.

4. Consulting services and Good/Works methods could either be used for Non-Consulting Services:

5. All days are calendar days.

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex 8: Project Implementation Manual (PIM)

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department



Brazil

Planting climate resilience in rural communities of the Northeast

GCF Additional Financing

Annex 8: Project Implementation Manual (PIM)

Document Date: 30/09/2020

Project No. 2000002253

Latin America and the Caribbean Division
Programme Management Department

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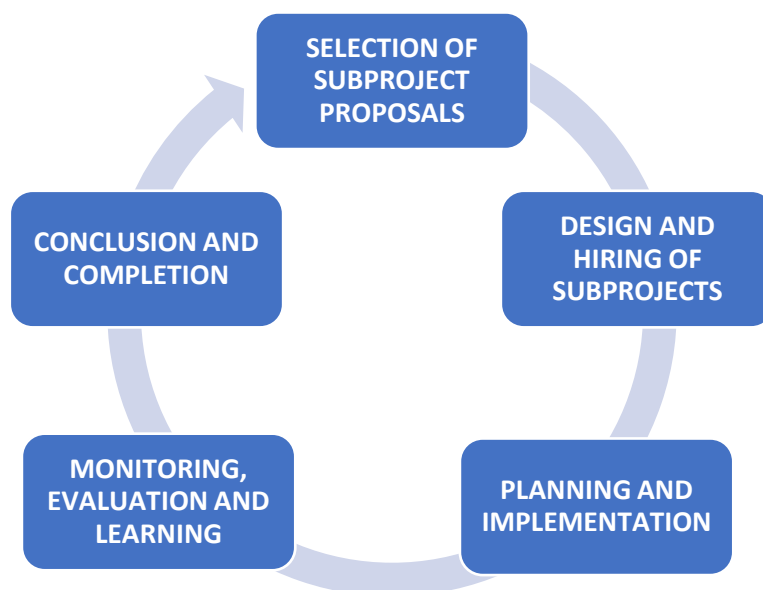
INTRODUCTION

The **Planting Climate Resilience in Rural Communities of the Northeast Project (PCRP)** is a project co-financed by the Green Climate Fund (GCF) and the International Fund for Agricultural Development (IFAD). The project is executed by the National Bank for Economic and Social Development (BNDES), with the sovereign guarantee of the Government of the Federative Republic of Brazil (GoB).

BNDES will directly execute and coordinate the overall project and is responsible for the final decisions of project implementation. Under a decentralized approach, implementation of the project activities will take place in semiarid region of participating states of Northeast Brazil¹. For that reason, the project will select 2 to 4 state-level subprojects proposals within the 9 states in the northeast region. A central-level Planning, Monitoring, Evaluation and Learning Unit (PMEL) unit will support all other subprojects with specialized knowledge and methodologies, in order to promote a harmonization between them as well as expand the project outreach and exchange of experiences.

This Project Implementation Manual (PIM) for the PCRP was aligned to this decentralized approach and organized according to the processes' implementation sequence during the project life cycle, from the selection of implementing partners to the completion of the project. The PIM provides a practical reference tool to guide project implementation and to comply with contractual clauses between IFAD and BNDES on technical aspects and procedures (eligibility, selection, design, planning and implementation of interventions, monitoring and evaluation, supervision) as well as bidding and contract applicable rules, financial and accounting administration and audit procedures.

Figure 1. PCRP Lifecycle



¹ The Resolution 115 of 23/11/17 from Sudene defines these features of the Semiarid: i) Average annual rainfall ≤ 800 mm; ii) Thornthwaite Aridity Index ≤ 0.50 ; and iii) Daily percentage of water deficit $\leq 60\%$ (average of all days of the year). In the case of Maranhão, it will also consider Bill (Projeto de Lei) no. 2492/2019 which enlarges the semiarid of Maranhão to additional 44 municipalities. <https://www25.senado.leg.br/web/atividade/materias/-/materia/136472>

In the case of any differences between the PIM and the Financing Agreement, the latter shall prevail. The project implementer can propose modifications to the PIM in order to adapt it to new conditions or circumstances that may arise during project implementation, which will form part of the PIM once they have the prior No Objection (NO) from IFAD.

1. PROJECT OVERVIEW

The PCRCP will work towards a paradigm shift: if family farmers in the semiarid northeast Brazil (NEB) transform their productive systems, then they will be able to increase production while improving their autonomous capacity to face the challenges posed by ongoing climate change, because the adoption of climate resilient practices will result in farming systems that perform restored ecosystem functions. These systems will have climate change adaptation and mitigation benefits, increasing and stabilizing family income and food security while incentivizing young generations to stay active in rural activities. The PCRCP will work with the most marginalized and vulnerable groups of the poorest region in Brazil. The partnerships between IFAD, GCF, and Government of Brazil and BNDES will mobilize resources and disseminate lessons to many levels of government in other regions in Brazil and abroad.

The project consists of three components that reinforce one another to promote climate resiliency as well as emission mitigation: 1) Climate Resilient Productive Systems (CRPS); 2) Water access; and 3) Knowledge Management and Scaling-Up.

Component 1 will implement diversified agroforestry systems that will increase local water availability. The *Caatinga* is a rich productive area, with fertile soils, where temporary streams and wetlands exist, making up a biome with good capacity for agricultural production, provided that adapted vegetation is used, with adequate arrangements and techniques appropriate to the levels of humidity and solar radiation. The area has great biomass production capacity for multiple purposes and can afford to produce with quality, without use of industrial inputs. For this, it is enough to establish a vertically stratified system that promotes total coverage of the soil and maximizes use of sunlight.

The water access activities in Component 2, such as rainwater harvest and storage, if accompanied by the current agricultural model, may be temporarily palliative – subject to severe water loss due to high evapotranspiration from heat and wind – but productivity would remain limited. In fact, water investments in the semiarid must be complemented by soil recovery practices promoted in Component 1, to allow infiltration of rainwater, increase soil biomass rate, create shade and wind shelters to reduce evapotranspiration (which can exceed 2,000 mm/year). The specific flora and fauna in the semiarid have developed a high capacity to access and store water (in roots, trunks, stems and leaves), resulting in a biota capable of supplying more water than needed for growth and reproduction, adding surplus water to the system.

Knowledge management, policy dialogue, communication, and monitoring and evaluation (M&E) activities under Component 3, meanwhile, will allow the investments under Components 1 and 2 to be sustainable and scaled up to other states in the region and dryland areas, including other countries, resulting in the intended paradigm shift in approaches to climate adaptation and mitigation.

The project will directly benefit a total of approximately 1,000,000 people in 250,000 family farms (of which 40% are women and 50% youth), increase the resilience of agricultural production systems over 84,124 ha and restore degraded ecosystems of importance for the provision of environmental services. It

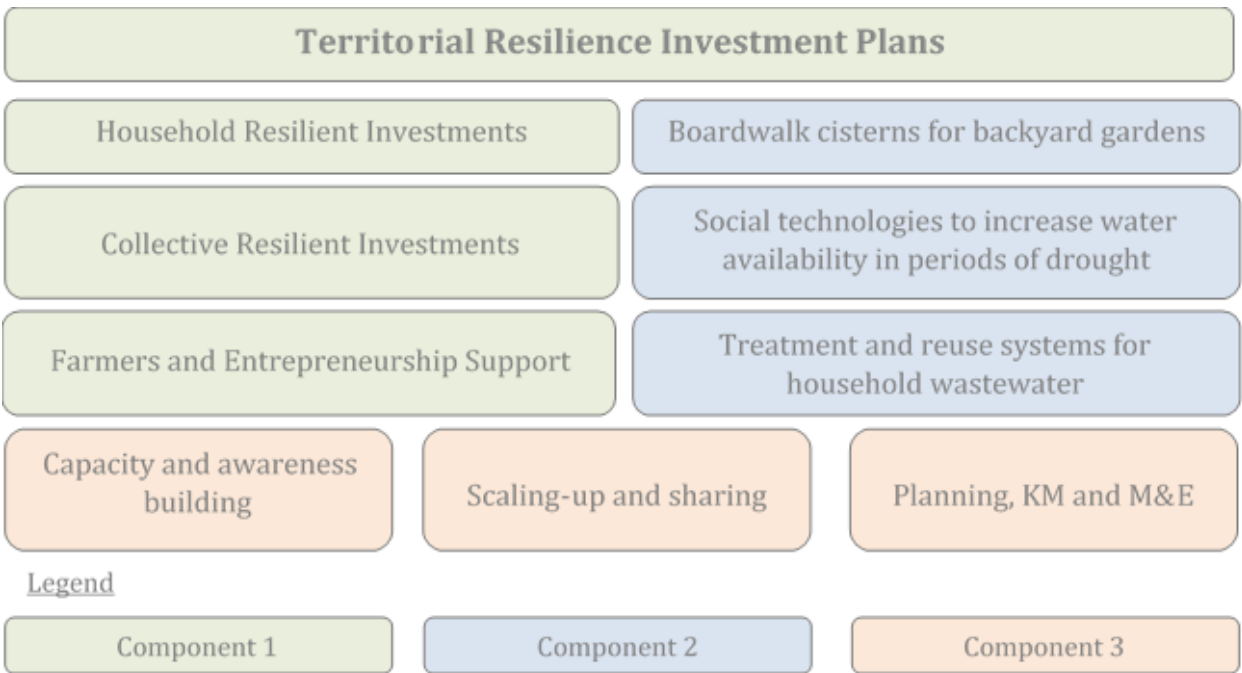
will increase the water access to 36,000 families, increasing their resilience to droughts. The project will mitigate between 11.2 million tCO2eq and 11.8 million tCO2eq over a 20-year period.

2. DESCRIPTION OF ACTIVITIES

Climate stressors aggravate the downward cycle caused by the inadequate practices translating into a decline in productivity, which in turn feeds into social and environmental degradation processes inducing the impoverishment of family farmers and ecosystem services. The partnership between IFAD, GCF, GoB, BNDES and Northeast states will shift from the predominant current paradigm to one characterized by the promotion of dense, stratified and diversified agricultural systems, farmer-led technology development, and active leadership from women and youth. It will mobilize resources and disseminate lessons to many levels of government in other regions of Brazil and abroad. PCRP will work with existing supply chains in each micro-region, increasing productivity and strengthening resilience, capitalizing existing infrastructure and processing units.

The project will consist of three complementary and mutually reinforcing components (pictured in the diagram below) to promote climate resiliency as well as emission mitigation: 1. Climate Resilient Productive Systems (CRPS), 2. Water Access, and 3. Knowledge Management and Scaling-Up. Selection of the productive systems and water access technology is described in the Feasibility Study.

Figure 2. Project Diagram



Component 1. Climate-Resilient Productive Systems (CRPS)

The main objectives of Component 1 are to implement diversified agroforestry systems that will increase local water availability in the productive system and empower beneficiaries (especially women and youth leaders) in sustainable management of these systems. Investment strategies have been designed to meet the diverse demands of family farmers, given the range of sizes of land areas, climate-resilient adaptation requirements, target beneficiaries, and productive objectives.

Activity 1.1.1. Selection of Project Areas and development of Territorial Resilience Investment Plans (TRIPs)

Through Activity 1.1.1, the project will select its implementation area and develop Territorial Resilience Investment Plans (TRIPs) which will act as a “master plan” to guide collective and individual investments in components 1 and 2. As sole Executing Entity (EE), BNDES will have the final decision making power on all project activities including: i) use of funds; ii) State selection and project implementation area; iii) final beneficiaries; iv) eligible practices and interventions; v) TRIPs final approval; vi) approval of procured TA Teams and service providers.

Sub-activity 1.1.1.1 Develop a baseline study to select project area The following tasks and selection criteria will apply:

Subactivity 1.1.1.1. Develop a baseline study to select project area

Step 1. Selection of states and PMEL. At a preliminary stage, the selection process will be based on state qualification, verification of borrowing capacity, poverty characteristics according to the PCRPs focus and targeting, climate vulnerability criteria, counterpart contribution capacity, implementation capacity (previous experience with IFAD or similar projects), social and economic indicators and implementation arrangements. The States taking part on the public call prepared by BNDES would be ranked through an in-depth analysis based on the following established criteria:

- (i) verification of borrowing capacity;
- (ii) state qualification;
- (iii) verification of counterpart capacity;
- (iv) incidence of rural poverty;
- (v) climate vulnerability index and historical exposure to drought;
- (vi) food and nutritional security index;
- (vii) water quality and availability;

After the application of the criteria, two to four NEB states will be pre-selected as eligible to present a Consultation Letter (Carta Consulta) to the Executing Entity (EE) – BNDES. This document will go through a deeper analysis by BNDES technical team before it is submitted for final approval by the BNDES’s Board of Directors. The process of selection of states, area and beneficiaries is included in more detail in the PIM (Annex 21).

Similarly, the institutions/organizations that participate in the competitive public call to implement activities of PMEL Unit, would be ranked through an analysis based mainly on the following criteria, and the pre-selected ones will present a consultation letter to the EE that will be thoroughly analysed by BNDES technical team and will be subject to the approval of BNDES Board of Directors:

- i) client qualification;
- ii) experience with the region and similar projects and themes;
- iii) experience with similar budget;

Step 2. Define project area in each selected state. The municipalities within states will be ranked through an analysis based on the following criteria: (i) rural poverty incidence; (ii) climate vulnerability index and historical exposure to drought; (iii) food and nutritional security index; and (iv) water quality and availability. Technical Assistance (TA) will be selected per area, with one extensionist serving an average of four communities or one territory (total of about 140 families) over a three-year period for Component 1 activities and a two-year period for Component 2 activities. This step will occur during the preparation of the State's proposal

Step 3. Select beneficiary groups. In the beginning of the implementation phase at state level, each state will propose the beneficiary groups, focusing on those with the greatest climatic, socioeconomic and environmental vulnerability.² A baseline survey will be conducted to collect information on agricultural production, herds, local climate, water availability, gender issues, and nutrition, among others of the target population. Priority will be awarded to marginalized groups such as traditional communities, youth, and women. Participation is not mandatory, so public awareness campaigns and stakeholder engagement are necessary (see activity 3.1.1). For indigenous people's communities, the project will also follow Indigenous People's Planning Framework (IPPF)..

Subactivity 1.1.1.2. Develop TRIPs. TRIPs are the planning tool for all activities proposed under Components 1 and 2. They include investments, resources, capacity building, and other initiatives to achieve the objectives. Each TRIP will cover an average of four territorially contiguous communities. To implement TRIPs, selected states will provide non-reimbursable funds (grants) to community organizations/associations. Final beneficiaries will only access such grants through community organizations/associations. The sub-grant agreements with community organizations and associations in Brazilian terms "acordos"; with which are in Brazilian legal terms called "convênio" (sub-grant agreement) and IFAD has in-depth experience with its operations and accountability. Final beneficiaries will provide 10% in-kind contribution of the total TRIP and this will be captured in the "convênioacordo". Technical assistance (TA) teams will be contracted by the States to design TRIPs with full involvement of beneficiaries based on the Manual for Designing Productive Investment and Business Plans. TA teams" are private service providers to be selected and procured by the states, following the guidelines of BNDES. Under component 1, four types of Investments in Systems of Agroforestry (ISAs) will be considered for: families (ISA Família), backyard gardens (ISA Quintais), communities (ISA Coletivo), schools (ISA Escola) as well as a pilot on Bio saline agriculture. Once completed, the TRIPs will be submitted by the SIU for validation and evaluation of the state-level Consultative Council and then will be submitted for final approval by the states to BNDES. This mechanism will ensure greater involvement, participation and empowerment. ³

Activity 1.1.2. Implement CRPS in family farms and backyard gardens

Through activity 1.1.2, CRPS will be implemented in Family farms and in backyard gardens. Investments will receive TA for development, implementation, and initial monitoring.

² These selection criteria will be applied: (i) the environmental precariousness rate of its property (signs of deforestation, erosion, and soil degradation); (ii) food and nutritional insecurity rates (malnutrition and chronic degenerative diseases); and (iii) tangible effects of drought and level of access to quality water.

³ Each state will set up a Consultative Council meeting to discuss TRIPS presented to the PMU to ensure their quality, in the various relevant scopes (alignment with project objectives, feasibility, etc.). This body may request additional information or recommend improvements that is considered inappropriate (see section B4).

Subactivity 1.12.1. Implement CRPS in family farms

Objective: Reduce vulnerability of production to droughts and increase income, developing a progressive culture of multiple sustainable uses of productive areas.

Selection criteria: Target beneficiary families (see subactivity 1.1.1) that have sufficient water for irrigated production on 0.5 hectare each.

Investments (ISA família): Resources to implement the CRPS.⁴

Area: 31,000 plots with an average of 0.5 hectare each (total 15,500 hectares)

Subactivity 1.12.2. Implement backyard gardens using CRPS

Objective: Develop irrigated, diverse and productive backyards in conjunction with activities in Component 2, applying CRPS principles to reduce families' food and nutrition insecurity from droughts, increase access to nutritious food as well as value and strengthen the role of women in production.

Selection criteria: Beneficiary group families (see subactivity 1.1.1) that have no water for production purposes. These beneficiaries will also receive water access investments in Component 2.

Investments (ISA Quintais): Resources to implement CRPS.

Area: 36,000 gardens with an average size of about 0.2 hectare each (total of 7,5000 hectares expected)

Activity 1.1.3. Implement Collective Resilient Investments

The funds for collective investments are also non-reimbursable and will follow the same co-funding and TA as individual investment in output 2.

Subactivity 1.13.1. Implement Collective Areas Sustainable Management (CASM)

With increasing population and land use in the Semiarid, there is a real threat that the communities with common land tenure could gradually deplete the Caatinga, mainly due to timber extraction for firewood and overgrazing.

Objective: The main objective is to improve the ecosystem services provided by the Caatinga, such as micro-climate regulation, carbon sequestration and fixation, pest and disease control, provision of water, decomposition of waste, natural pollination of crops and other plants, and provision of raw materials (timber, seeds, nuts, fruits, etc.). The system will stabilize and, if possible, increase the supply of forage. The enhanced ecosystem services help ensure that the community will be the main stakeholders in the conservation and recovery of the system in which they live in.

New options for income generation are needed, especially for women and youth, and the increase of forage for the herd, so that the animals gain more weight and compensate for possible loss of income due to the herd's reduction. It is possible to develop a slow and progressive culture of multiple and sustainable uses of the Caatinga and reduce extensive grazing, while increasing income, encouraging family succession, and conservation and recovery of the ecosystem services offered by the Caatinga.

Selection criteria: Communities that have a collective use area of around 500 hectares or more.

Undertakings:

⁴ Seeds, seedlings, fertilizers, equipment rental or purchase, irrigation systems, tools, fences, etc.

- Recover degraded areas using CRPS;
- Decrease timber demand by implementing eco-efficient stoves and biodigesters;
- Increase supply and efficient use of water for production;
- Structure community seedbanks and nurseries;
- Promote low-impact productive activities in collective areas (e.g., beekeeping).
- Strengthening community governance of access and sustainable use of the areas.

Area: 60 CASM with an average size of 600 hectares each (total 36,000 hectares).

Investments (ISA coletivo): Tools and materials for implementing CRPS, nurseries, eco-efficient stoves and bio-digesters.

Subactivity 1.1.3.2 Implement CRPS in Schools

Rural schools are where young people, children of farming families acquire knowledge on various subjects, such as rural life and agricultural production. The project will seek to enable these educational institutions to teach sustainable practices.

Objective: Enable rural educational institutions for youth to experiment and teach CRPS, rational use of water for production, renewable energies, and other resilient practices to students. Target the cooks who prepare school meals, encouraging them to use native fruits and vegetables, reinforcing children's food and nutritional security.

Selection criteria: Rural schools within a range of the target areas (see subactivity 1.1.1). Preference will be awarded to Family Agriculture Schools (EFAs).

Undertakings:

- CRPS teaching and experimentation;
- Development and maintenance of nurseries and seedbanks;
- Promotion of entrepreneurship in CRPS; and
- Training for cooks and students on the nutritional value of native fruits and vegetables to diversify and enrich diets.

Area: 1,000 schools (with about 100 families per school) with at least 0.1 hectare each (total 100,000 families and 100 hectares).

Investments (ISA escola): Resources to implement the CRPS, such as seeds, seedlings, organic fertilizers, equipment rental or purchase, irrigation systems, tools, fences, nurseries, training materials, computers, etc.

Subactivity 1.13.3 Test productive models of Bio saline agriculture

In the Semi-arid, brackish or salty groundwater is common. Around 25% of wells have freshwater (< 500 mg/l TDS⁵), 33% are brackish (501–1,500 mg/l TDS), and 42% salty (>1,500 mg/l TDS).⁶ An estimated 75%

⁵ TDS – Total dissolved solids.

⁶ MME-CPRM-SERVIÇO-GEOLÓGICO-DO-BRASIL. **Projeto Cadastro da Infra-Estrutura Hídrica do Nordeste. Relatório Preliminar - 1ª Etapa - 225.000 km² - Versão Beta.** Brasília: MME-CPRM-Serviço-Geológico-do-Brasil. Available at: https://www.cprm.gov.br/publique/media/hidrologia/m_apas_publicacoes/cadastramento_fontes_semiarido_brasileiro.pdf. 2003.

of the wells in the Semiarid are unfit for human consumption. There are over 500 desalinization units operating in NEB, which produce residual water that currently accumulates in evaporation tanks with no productive use.

Objective: Develop pilot testing of productive activities using effluent from the desalination process.

Selection criteria: Communities benefitted from collective desalinization systems, especially those under the Programa Água Doce (PAD).

Undertakings: Fish breeding and irrigation of halophyte plants in small areas.⁷

Investment: Fish, tanks, irrigation equipment, resources to implement the CRPS, soil laboratory tests, etc.

Number of bio-saline production systems: 24 bio-saline systems each irrigating 1 hectare and benefiting 50 families (total 1,200 families and 24 hectares).

Activity 1.1.4. Build a Farmers Network and Promote local entrepreneurship for products and services that support family farming

To facilitate the replication of CRPS, support will be provided: i) TA teams will build a territory-based intervention strategy identifying properties demonstrating exemplary experiences of CRPS and water access technologies and building a network to exchange these good practices; and ii) Small grants and business management support to microenterprises that innovate and produce specific tools and equipment to facilitate the implementation of CRPS.

Subactivity 1.1.4.1 Build a Farmers Network

The following tools will be used:

Task 1.1.4.1.1 Train Farmers

TA teams will need to be trained in CRPS principles and practices, water access technologies and gender-transformational approaches, appropriate for indigenous and traditional communities and that attract youth.

In addition, farmers who already implement aspects of CRPS will be invited to become farmer-trainers. Their selection will not be limited by the criteria of target group or property size. They can have several roles in the project; from integrating TA teams, allowing visits to their farms as demonstration plots, or participating in local farmer network, trainings and workshops. The Project will ensure both women and men become farmer-trainers.

Task 1.1.4.1.2 Hold exchange visits; an important source of practical information and knowledge sharing. They involve organizing a group of farmers to visit another farmer or group. Although usually the visit is done to a 'more advanced' group, it is not a one-way process, because visitors discuss and comment what is being observed. These initiatives are often more effective than courses or lectures on the same topics due to language similarity and experience of real-life situations. Farmers from 5,000 medium-sized farms (at least 5 hectares) located in the project's region will be invited to participate in the exchange visits. There will be an active participation of Young Communicators in these exchanges (see subactivity 3.1.1.1).

⁷ Hoffman and Shannon, 1985

Messaging apps are widely used in Brazil and can be applied to bridge communication gaps in farming communities. TA can create and manage online social-media groups to share experiences on specific topics and solve problems promptly. These groups can further the sharing of the knowledge learned in the exchange visits.

Subactivity 1.1.4.2 Promote local entrepreneurship for products and services that support family farming

Most small-scale products and tools available to farmers are directed towards traditional large-scale monoculture, creating a vicious cycle that makes farmers turn to non-resilient production practices. Specialized small-scale equipment and mechanization can make farmers more productive and able to add value to their production.

The few scattered farmers who dare challenge the model must develop or adapt their own tools. During visits to Bahia and Pernambuco, the design team witnessed several examples of these innovations: forage palm chopper and feeder, long-arm pruning shears, wood chipper, and low-tech water reuse facility, among others. This thriving creativity and potential demand face high barriers to their widespread use. Microentrepreneurs in this sector are mostly small and lack the management capacity for commercial financing, making efforts to scale up or even start their businesses nearly impossible. Their innovations usually never go beyond their plot.

With greater access to capital – especially capital with management assistance and sustainability conditions tied to it – microentrepreneurs with businesses that have a direct impact on climate resilient agricultural production can scale up their operations and influence family farmers beyond the project's direct beneficiaries to improve their practices. A dynamic business environment can also attract youth.

In light of the above, the project will support investment in small-scale mechanization⁸ of microenterprises that provide services or products for improving family farmers' CRPS, thereby enhancing rural entrepreneurship. Small grants may support microenterprises that innovate and produce specific tools and equipment, nurseries, composting services, apps to manage production, organic fertilizers, pest control, and market platform, etc. These enterprises will also receive business management support. The GCF grant will cover the incremental costs associated with higher-than-average screening, evaluation and technical assistance costs of the fund's investments. The small grants to microenterprises will be provided by states under specific legal agreements to microenterprises selected through a competitive process, following BNDES approval of the criteria following BNDES final approval.

Expected results of **Component 1** include:

- | | |
|--|--|
| • 575 TRIPs designed and approved; | • 1,800 families from 60 communities benefiting from CASM; |
| • 31,000 families benefiting from Family Farms Investments and TA; | • 540 eco-efficient stoves installed; |
| • 36,000 families benefiting from backyard gardens investments and TA; | • 540 biodigesters built; |
| • 1,000 schools teaching CRPS; | • 540 income-generating and resilient production-based activities in collective areas; |

⁸ According to Brazilian Law, "microenterprise" is defined as a company with annual gross revenue of less than R\$ 360,000.

- 1,200 families benefiting from 24 bio-saline productive systems;
- 5,000 medium-sized (at least 5-hectare) productive units participating in farmers networks;
- 550 TA and farmer trainers trained;
- 24,000 farmers participate in exchange events / workshops;
- 84,124 hectares under sustainable management;
- 11 MtCO₂e emissions reduced; and
- 70 micro enterprises supported to supply small-scale equipment for CRPS.

Component 2. Water Access for Production

The purpose of this component is to disseminate practices in efficient water capture, harvesting, storing and use to decrease vulnerability of livestock / crops to rainfall irregularity and prolonged droughts. All investments in this component will be financed as determined in the TRIPs for beneficiary groups (described in activity 1.1.1).

Component 2 beneficiaries will be the ones that will implement backyard gardens (described in subactivity 1.1.2.2). Irrigation in small plots allows diversified production, mainly with fruits and vegetables, for family consumption and to sell surpluses.

The TA provided to the beneficiaries will focus on addressing issues of efficient water management, good irrigation practices, techniques for limiting evapotranspiration, and precautions to prevent soil salinization. All pumping systems will use renewable energy (photovoltaic or wind).

All water infrastructure methodologies selected in the PCRP are widely disseminated in NEB and are extremely simple to build, known in Brazil as “social technologies”. Construction of the water infrastructure technologies listed below is usually carried out by trained community masons, beneficiary families, and their neighbours with oversight from TA teams.⁹ In addition to creating an activity for local workers, it also ensures future maintenance of the cisterns without relying on outside services. Technical training and training in water management will be systematically provided in association with the construction process.

Through the use of water technologies, the project will deliver Output 2.1 Improve water access to family farmers and traditional communities to reduce the impact of severe droughts by investing in small-scale technologies for harvesting, reuse, treatment and storage.

Activity 2.1.1. Build boardwalk cisterns for backyard gardens¹⁰

Investment: Materials to construct cisterns; irrigation equipment; tools and materials for implementing CRPS. Construction of a plate tank with storage capacity of 52 m³, coupled with a 200 m² concrete water-catchment area (boardwalk or *calçada*).

⁹ The same technique has been used for construction of cisterns in the One Million Cisterns Program.

¹⁰ Cisterna Calçada - Instruction regulated by Law number 12.873, dated October 24, 2013. Decree number 8.038 of July 4, 2013 and Ordinance number 130 of November 14, 2013.

Application: Irrigate small plots to support short-cycle crops (mainly vegetables) during dry season. The role of women in this production is fundamental. Impact on family food security and nutrition are significant.

Total: 20,000 cisterns.

Activity 2.1.2. Implement social technologies to increase water in the field

Subactivity 2.1.2.1 Build small farm ponds ¹¹

Investment: Small-width deeply excavated reservoirs that store at least 500 m³ of rainwater to reduce evaporation and retain water for longer periods.

Application: Irrigate plots and support short-cycle crops during dry season.

Total: 500 farm ponds.

Subactivity 2.1.2.2 Construct small groundwater storage basins

Investment: Construction of small underground dams through a transversal blocking system along temporary streams and river banks, with flexible plastic sheeting lining a trench (from surface to rock or impermeable layer).

Application: Capable of irrigating larger areas and storing a significant quantity of water for several months.

Area: 500 small underground dams.

Activity 2.1.3. Implement treatment and reuse systems for household wastewater

For rural families, untreated water represents risks to the environment, soil, and human health. Only 27% of the NEB population (mostly in urban areas) has access to sewage collection and treatment.¹² The treatment systems selected use simple and affordable technology based on cycling water and nutrients for food production. These technologies adapt forms of rural sanitation to the household level and contribute significantly to sanitary improvement of environmental and living conditions of beneficiary families.

Subactivity 2.1.3.1 Implement systems for grey water reuse

Investment: Construction of treatment system consists of filtering grey water residues through physical and biological mechanisms, in which organic matter is biodegraded by microorganisms and earthworms.

Application: Irrigate small plots, such as backyard gardens and nurseries.

Area: 10,000 greywater treatment systems irrigating 0.05-hectare plots (250 hectares).

Subactivity 2.1.3.2 Implement green septic tanks

¹¹ Instruction regulated by Law 12,873 of 24 October 2013, Decree number 8,038, of 4 July 2013 and Ordinance number 130, of 14 November 2013.

¹² Instituto Trata Brasil, see: <http://www.tratabrasil.org.br/saneamento/principais-estatisticas/no-brasil/esgoto>

Investment: Construction of evapotranspiration tank (or green septic tank). Anaerobic digestion, which occurs in septic bed, consumes organic matter from household waste in the root zone of the plants.

Application: Can irrigate trees (usually banana trees, which are part of the treatment systems) and non-edible plants.

Area: 5,000 blackwater treatment systems irrigating 0.05-hectare plots (250 hectares).

Expected results of **Component 2** include:

- 20,000 cisterns with walkway;
- 500 trench barriers;
- 500 small underground dams;
- 10,000 greywater reuse systems;
- 5,000 blackwater treatment systems.

Component 3. Knowledge management and scaling-up

Component 3 supports and expands on the activities in Components 1 and 2. The activities described below will be explored in the project so that information flows serve both to consolidate learning among families who will experience new approaches in CRPS and water access as well as to scale to a regional and international level the adaptation and mitigation measures that the project will propel. Strategies developed will drive upscaling and deliver Output 3.1 CRPS and small-scale water harvesting system disseminated in the NEB semiarid and abroad to increase climate resilience of vulnerable communities.

Part of Component 3 (activity 3.1.2 - sub-activities 3.1.2.1, 3.1.2.2, and sub-activity 3.1.3.1.) will be conducted thorough the establishment of the Planning, Monitoring, Evaluating, and Learning Unit (PMEL - see B.4 below). The entity which will conduct activities under PMEL will be selected by BNDES following an open selection process by the submission of a consultation letter (carta consulta), which will be subject to analysis and approval by BNDES according to its internal procedures, and without the involvement of the states. The recruitment of TA teams and selection of beneficiaries for the above mentioned activities will be conducted by the entity selected for PMEL under direct guidance and approval by BNDES. It will not involve sub-grants. The States will conduct activity 3.1.1 – sub-activities 3.1.1.1., 3.1.1.2 and 3.1.3.2 of Component 3, following BNDES guidelines.

Activity 3.1.1. Raise awareness and build capacities of women, youth and traditional communities

This activity combines several strategies: i) highlight the leading role of youth and women as 'knowledge managers and generators' and 'local talents'; ii) consolidate laboratories for learning, exchange and replication of sustainable practices in communities through a set of printed and audio-visual materials; iii) facilitate dynamic M&E of socio-environmental impacts, which will be registered in materials that allow effective influence in spaces dedicated to public policy making.

Subactivity 3.1.1.1. Develop a young communicators network

A total of 450 young people will be selected to participate in a media resource empowerment program focusing on successful experiences in accessing water resources and CRPS. In addition to being responsible for registering activities and facilitating production of audio-visual and printed materials, Young Communicators (YCs) will act as “social mobilizers”, fulfilling a crucial role in social organization processes.

Another important initiative in which YCs will take part, together with the farmers' network (see subactivity 1.1.4.1), is the construction of a participatory monitoring model with audio-visual resources.

Local and regional exchanges between YCs will be promoted. YC will work closely with TA teams and community-based partner organizations. Each will receive a scholarship through a "learning grant" and have access to equipment (mobile phones and notebook computers).

Subactivity 3.1.1.2. Strengthen capacity for women, youth, and traditional communities

All educational activities (workshops, courses, exchanges, etc.) will follow a "learning by doing" approach that explores experimentation of alternative technologies and information exchange among community members. Given that women, youth, and traditional communities tend to be on the margin of community-based organizing efforts, the project will prioritize capacity-building opportunities targeting these groups.

(i) **Rural women:** The project strengthens rural women's capacities as part of a comprehensive environmental education program that explores the connections between feminism, women's rights, the semiarid region biomes, agroecology, and food and nutritional security.

(ii) **Youth:** In addition to YC networks, youth will be involved in short-term professional courses with a focus on diversity of production systems and CRPS. The youth will then be incorporated in TA teams and serve as liaisons with families.

(iii) **Traditional communities:** Implementation of sensitivity trainings for TA professionals in issues of race and ethnicity, with a focus on methodological approaches and instruments that address the relationship these communities have with natural resources and land management techniques. The second line of action involves conducting case studies in traditional communities.

Activity 3.1.2. Drive scaling-up, unlock policy barriers and experiment with CRPS and resilience participatory monitoring model

Subactivity 3.1.2.1 Promote south-south cooperation

Another aspect of this project involves developing capacities by sharing knowledge, skills, resources and technologies among countries through the construction of a more horizontal relationship of solidarity than the classic "North-South" cooperation. At the start of implementation, the exchange sites inside and outside Brazil and the prioritized systematization methods will be identified. IFAD is currently implementing the Dryland Adaptation Knowledge Initiative (DAKI,) which will pave the way for the project implementation, among other activities, will develop distance learning online platform in foreign languages and this tool could be used in case trips cannot materialize. At the start of implementation, the project will define the exchange sites inside and outside Brazil, the method of interaction (online or in person) and the systematization methods. In addition to TA team members, farmers will be invited to participate. The project will invest in construction of a database cataloging the practices and technologies for proper management of natural resources that have been identified in these different contexts.

Subactivity 3.1.2.2 Facilitate discussions to unlock policy barriers

The National Forest Code requires farmers in the Northeast to preserve 20% of their land as legal reserve. Family farmers, however, can perform certain productive activities in their legal reserves such as agroforestry and beekeeping. The Forest Code anticipates that States could implement a legal reserve

quota (CRA) market, where farmers that preserve above their required 20% could sell their quotas. Several policies that are constraining family farmer's CRPS were identified during project design. The most notable include: i) lack of an Environmental Reserve Quota (CRA in Portuguese) market; and ii) norms and regulations preventing family farmers from accessing markets.

As recommended by the World Bank,¹³ establishing the CRA market could provide additional incentives for family farmers to increase the area covered by the climate-resilient agriculture principles laid out in the project. A CRA credit produced on a beneficiary's property could be used to offset a legal reserve (RL) debt on another property within the same biome, preferably in the same state. The RL debts represent obligations acquired by any given farmer that can be efficiently offset by environmental improvements produced by smallholder farmers with CRPS, thereby generating a transfer payment from the RL offender to the smallholders. Implementing a state CRA could create a market for forested lands, adding monetary value to a preserved Caatinga. Given the high costs of restoration/reforestation in the Caatinga and the climate-resilient agriculture principles laid out in the project, exchange of CRAs could become an effective way to facilitate Forest Code compliance, meeting NDC targets and preventing deforestation of surplus native vegetation.

The Committee on World Food Security and FAO (2016) recommend that governments employ public policy to support family farmers with respect to issues such as pricing policies, public procurement, food safety and standards, and appropriate credit and infrastructure. Family farmers in Brazil are affected by top-down imposition of food safety standards designed to respond to large-scale mechanized and standardized food production for commodities and large distribution channels. As a consequence of these entry barriers, family farmers revert to informal markets with lower demand and prices.

The project will facilitate discussions in forums on marketing and market access for family agriculture. The proposal is to take advantage of existing organizational structures, reinforce them and create new ones. These working groups should involve a broad set of stakeholders (e.g., project beneficiaries, NGOs, private and public sectors) and develop a roadmap to implement the CRA markets and improve regulatory conditions for family farmers' access to markets. It will also commission research on targeted policy and regulatory issues.

To qualify the inputs made in these forums on public policy, materials (publications and videos) will be produced that present results of the actions undertaken, in accordance with the progress indicators used in the M&E system. These publications – that present concrete social, environmental and economic results of transitioning to a model of family farmer CRPS – can influence public opinion, which in turn can contribute to the “scaling up” process.

Subactivity 3.1.3 Experiment with CRPS and resilience participatory monitoring model

Since transition to CRPS is gradual and its social, economic and environmental impact not immediately perceived, a monitoring methodology is needed that gives visibility to transformations promoted during

¹³ The World Bank, June 2017. Brazil's INDC Restoration and Reforestation Target, Analysis of INDC Land-use Targets. Report No. AUS19554.

implementation. Systematization processes will be published and subsidize political advocacy processes, reaching external stakeholders, such as public managers and institutions working on related topics.

Activity 3.1.3. Plan, Monitor, Evaluate and Learn

An independent closing evaluation and mid-term review is part of the project. Activities will be carried out at national and state level as follows (More details in Annex 11):

Sub-activity 3.1.3.1. PMEL: at the National (Regional) level, undertakings include: building-up an information platform based on systematizations and innovation experiences, 12 GIS evaluations (4 at start-up, 4 at midterm and 4 at completion), contracting yearly M&E, IT and Communications services, collecting data and information for preparing the Project Completion Report, carrying out M&E meetings and planning workshops (one per year) and elaborating 4 Studies, Systematizations and other Knowledge Management products (2 at mid-term and 2 at completion).

Subactivity 3.1.3.2. PMEL: at the State level, undertakings include: 12 Studies, systematizations and other Knowledge Management products (4 per State), 21 planning workshops, 21 M&E meetings and 21 Territorial Committee Meetings (1 per year per State). It also involves elaborating the baseline study, mid-term review and impact evaluation including the Women's Empowerment in Agriculture Index (PRO-WEAI) and Minimum Dietary Diversity for Women (MDDW) Studies¹⁴. Finally, the M&E system at the State level includes 3 more State-specific studies.

Expected results of Component 3:

- 54 workshops for young social communicators;
- 100 systematizing workshops;
- 9 state exchanges;
- 36 regional exchanges;
- 450 youth benefited with scholarships and communication equipment;
- 70 newsletters and informative reports produced;
- 300 training workshops for women about sustainable technologies;
- 360 territorial meeting for women;
- 12 exchange programs for women;
- 27 training workshops of gender experts;
- 243 training workshops for youth;
- 4 national learning routes;
- 3 international learning routes - LAC and Africa;
- 8 thematic studies.

3. IMPLEMENTATION ARRANGEMENTS, ROLES AND RESPONSIBILITIES

IFAD: On its role as cofinancier and recipient of GCFs resources, IFAD will be responsible to carry out project supervision, mid-term review and final review missions. IFAD will also perform implementation support missions, and prior review all of all project benchmark documents, as well as main procurement

¹⁴ The Project-level Women's Empowerment in Agriculture Index (pro-WEAI) and Minimum Dietary Diversity for Women (MDD-W) indicators studies will be developed together with the baseline and completion studies.

processes and institutional agreements, issuing its no-objection accordingly. IFAD will also be responsible to report the GCF annually on the project's performance.

The Executing Entity (EE): the Brazilian Development Bank (BNDES), which is part of the Federal Government of Brazil, will be the project's Executing Entity and the borrower of the loans from IFAD and GCF, and will operate the sublending to the selected states. BNDES is a public company wholly owned by the Federal Government with legal personality incorporated under private law, and linked to the Ministry of Economy (ME). As sole Executing Entity (EE), BNDES will have the final decision making power on project activities including: i) use of funds; ii) State selection and criteria for project implementation area; iii) criteria to select final beneficiaries; iv) criteria to define eligible practices and interventions; v) criteria for TRIPs approval; vi) requirements to procure TA teams and service providers. BNDES will verify the application of the criteria and requirements, and will provide final approval

The Central Project Management Unit (CPMU): The CPMU will be housed within BNDES (the Executing Entity - EE) to monitor implementation, compile physical and financial information, report to IFAD and be overall accountable for the overall implementation of the project. The CPMU coordinates subprojects' implementation by SIUs in line with the PIM, which can be updated according to needs provided the no objection from IFAD is obtained. It also approves the state-level subproject AWPBs, PACs, TRIPs and physical and financial Progress Reports, and compiles overall subproject AWPBs, PACs, and physical and financial Progress Reports. It oversees, evaluates, guides and advises overall project execution. It also has the central role of communicating directly with IFAD (for example for no-objection requests), performing financial management, accounting and financial reporting to IFAD, engages auditors and submits audit reports to IFAD, relative to the activities of the overall Project. The CPMU will be headed by a Project Coordinator to be appointed by BNDES with prior no objection from IFAD.

State Level Implementing Units (SIUs): A SIUs will be established for each state subproject to implement Components 1 and 2 specific activities and sub-activities of Component 3 at state level in line with the PIM and guidance of CPMU. . These management structures will be responsible for procurement, financial management and monitoring of their own state-based subproject activities in line with BNDES guidelines and final decision. Each state subproject will be implemented by way of a state level financing agreement with the BNDES. All subproject agreements will comply with IFAD policies on financial management, procurement, auditing, monitoring, eligibility, and anticorruption, as well as requirements defined by BNDES in its co-financing policy. The state level financing agreements will mirror the relevant arrangements established in the Financing Agreement(s) and comply with its or their provisions. Before granting the no-objection to the subproject agreements, IFAD will conduct a financial management assessment of the corresponding SIUs to ensure that the appropriate financial management arrangements are in place. Whenever possible, subprojects will build upon pre-existing operational structures of IFAD-supported projects, within the state secretaries responsible for family farming and no new structure will be established. The terms of reference (TOR) and selection of core SIUs staff will be submitted to IFAD for prior review and no-objection, according to the PIM. The selection of support consultants by the SIUs will take place through an open and competitive process, with prior review by IFAD and BNDES. Each state-based SIU will be headed by a Subproject Manager to be appointed by state secretaries responsible for family farming, and the key staff indicated in Section 6.1 below. The staff of the SIUs will work full-time for the project.

Planning, Monitoring, Evaluating, and Learning Unit (PMEL): The PMEL Unit will be responsible for specific activities and sub-activities of Component 3 in line with the PIM and guidance from the CPMU. It

will be subcontracted by BNDES through a tender process. It will be headed by a PMEL Manager, approved by BNDES and appointed with no objection from IFAD. The PMEL implementation will be contracted by the CPMU and it will 'perform financial management, procurement and contract management; and provide full access to and collaboration with the project auditors; submit requests for no-objections to BNDES, for passing on to IFAD; ensure procurement is compatible with the Project's social and environmental safeguards; submits AWPBs, including procurement plans, and physical and financial progress reports for the subprojects to BNDES; ensure that contractors are familiar with GCF, IFAD and BNDES policies, norms and procedures to: (i) avoid ineligible expenditure and delays in projects implementation; (ii) protect the assets of the project; develop TOR and cost estimates, technical specifications and budgets; conduct analysis of quotations, technical and financial proposals; prepare price calculation maps, reports of portfolio, technical and financial evaluation; and manages respective contracts provided for procurement and contracting plan.

Advisory Committee: It will advise the CPMU on the general direction of project execution towards the achievement of the Project's agreed results, and promote the integration and alignment with other government projects, programs and policies. It will ensure Project efficiency, integration with other programs / policies, and achievement of expected results. It shall be composed of representatives from the federal government (one representative nominated by NDA within the Ministry of Economy, and other federal Ministries such as one representative nominated by the Ministry of Agriculture, Livestock and Food Supply - MAPA, by the Ministry of the Environment – MMA, by the Ministry of Regional Development - MDR), civil society organizations (one per state nominated by the participating farmers'organisations), two by each subnational participating state (one nominated by the Secretary responsible for finance and/or planning, and one of the Secretary overseeing the SIUs), and two from BNDES. IFAD may participate as an observer. The Advisory Committee will meet at least once per year, usually by videoconference, to review the AWPB before its submission for IFAD's no objection. It would also review the annual progress reports remotely before their dispatch to IFAD. The Project Coordinator will act as Secretary of the Advisory Committee, calling for meetings and dispatching key information at least two weeks ahead of the meetings, and preparing the minutes.

Consultative Councils: Each state level SIU will establish a Consultative Council to ensure attainment of objectives, transparency and equity as well as participation from stakeholders, which, following the practice of the ongoing IFAD-supported projects, will include two representatives of beneficiaries and civil society (including traditional communities) in addition to a representative each from the state secretariats responsible for finance/planning, rural development and environment. The beneficiary and civil society representatives will be selected every 2 years by farmers'organisations participating in the project, whereby one representative will be selected by traditional communities as long as these are participating in the subproject. Each of the 5 council members will have one vote. The participation will be voluntary. The project will finance travel to council meetings. Its main role will be to advise the SIU regarding the general direction of subproject execution towards the achievement of its agreed results, to review and clear state level AWPBs and TRIPs before the CPMU final approval. In the case of the KM subproject, its Consultative Council shall also be composed of all the other Subproject Managers, in order to promote project integration. The Subproject Manager will act as Secretary of the Management Committee, calling for meetings and dispatching key information at least two weeks ahead of the meetings, and preparing the minutes.

Legal basis for implementation: The main legal agreements will be the funding activity agreement between the GCF and IFAD; the Financing Agreement(s) between IFAD and BNDES; and the state level

financing agreements between BNDES and participating state governments, and the Convênios between the states and final beneficiaries.

Figure 3. Project management structure

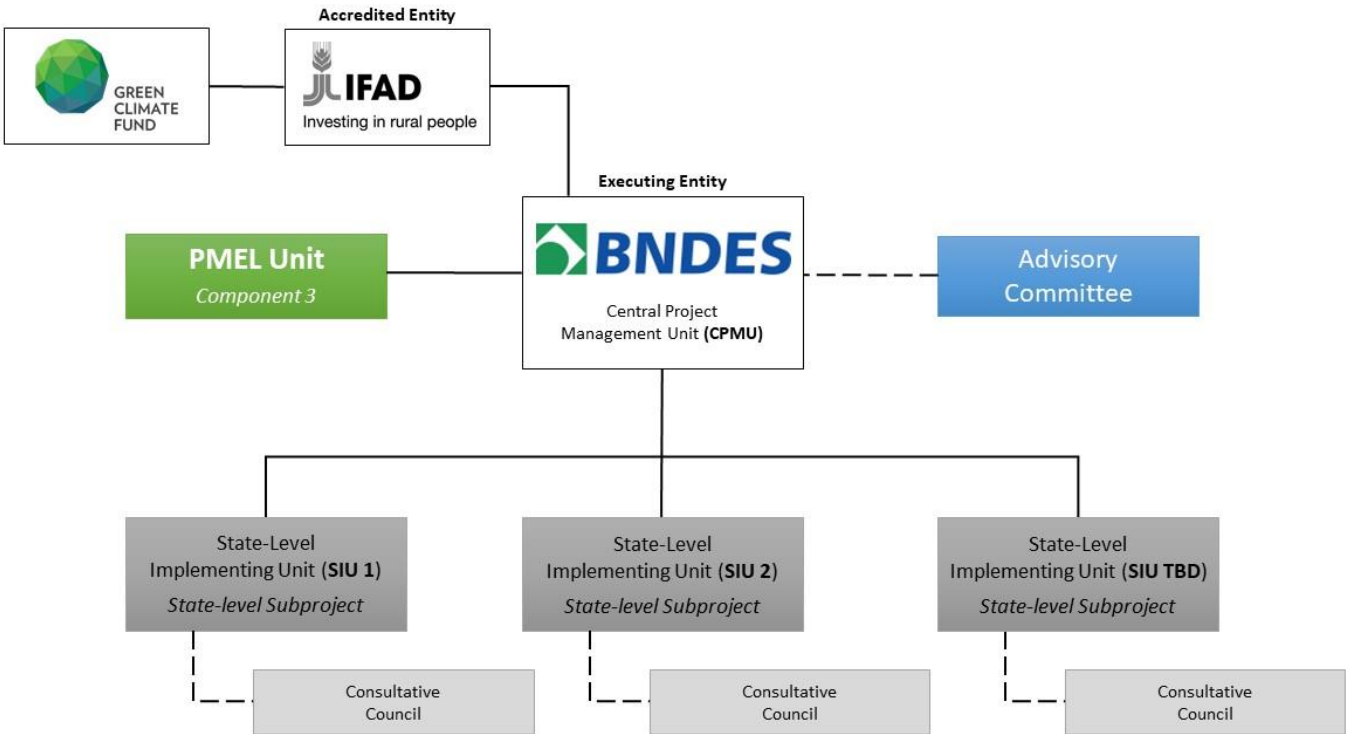


Table 1. Institutional governance and key responsibilities

ARRANGEMENT	COMPOSITION	RESPONSIBILITIES
IFAD	IFAD team headed by Country Director	Produces the GCF's Annual Performance Reports on the basis of the progress reports received from BNDES; Carries out the supervision (includes the findings of the field supervision missions), implementation support, mid-term, implementation support and final review missions, and reports as necessary; Reports to the GCF; Conducts prior reviews and issues no-objections.
Central Project Management Unit (CPMU)	BNDES team headed by Project Coordinator	Housed in the Executing Entity, has final decision making power. Executes the overall project and coordinates state-level subproject implementation and PMEL Unit in line with the PIM; Oversees, guides and evaluates project execution; Approves the state-level sub-projects' AWPBs; Guides the PMEL and SIUs on subproject implementation, including AWPBs, operational issues and reporting; Submits AWPBs, including procurement plans, and physical and financial progress reports for the overall project to IFAD; Performs financial management, accounting, engages auditors and submits audit reports to IFAD, relative to the activities of the overall Project; Submits Withdrawal Applications to IFAD; Requests IFAD no-objections as defined in the PIM; Proposes changes to the project design based on implementation experience and external circumstances (including the project's logical framework and the PIM).
State-Level Implementing Units (SIUs) State-level subproject	Subproject teams headed by Subproject Manager	Implements Components 1 and 2, Activity 3.1.1, and Sub-activities 3.1.2.3 and 3.1.3.2 at state level in line with the PIM and the guidance of CPMU; TRIPS first level approval; Perform financial management, procurement and contract management; and provide full access to and collaboration with the project auditors; Submit Withdrawal Applications to BNDES; Submit requests for no-objections to BNDES, for passing on to IFAD; Ensure procurement is compatible with the Project's social and environmental safeguards; Submits AWPBs, including procurement plans, and physical and financial progress reports for the subprojects to BNDES; Ensure that contractors are familiar with GCF, IFAD and BNDES policies, norms and procedures to: (i) avoid ineligible expenditure and delays in projects implementation; (ii) protect the assets of the project; Develop TOR and cost estimates, technical specifications and budgets; Conduct analysis of quotations, technical and financial proposals; Prepare price calculation maps, reports of portfolio, technical and financial evaluation; and Manages respective contracts provided for procurement and contracting plan.
PMEL Unit	Planning, Monitoring, Evaluating, and Learning Unit headed by PMEL Manager	Implements Sub-activities 3.1.2.1, 3.1.2.2, 3.1.3.1 in line with the PIM and the guidance of CPMU. Perform financial management, procurement and contract management; and provide full access to and collaboration with the project auditors; Submit requests for no-objections to BNDES, for passing on to IFAD; Ensure procurement is compatible with the Project's social and environmental safeguards; Submits AWPBs, including procurement plans, and physical and financial progress reports for the subprojects to BNDES; Ensure that contractors are familiar with GCF, IFAD and BNDES policies, norms and procedures to: (i) avoid ineligible expenditure and delays in projects implementation; (ii) protect the assets of the project; Develop TOR and cost estimates, technical specifications and budgets; Conduct analysis of quotations, technical and financial proposals; Prepare price calculation maps, reports of portfolio, technical and financial evaluation; and Manages respective contracts provided for procurement and contracting plan.
Advisory Committee	Representatives from the NDA, federal government, civil society, participating states, BNDES	Contribute to project efficiency, integration with other programs / policies, and achievement of expected results. Advises on general direction of project execution; and Promotes integration and alignment with other government projects, programs and policies.
Consultative Councils	Representatives of State Administration, beneficiaries and civil society	Contribute to attainment of objectives, transparency and equity. Reinforce participation of beneficiaries and civil society representatives (including indigenous peoples) in addition to representatives from state secretariats. Review the subproject's AWPB. Assess activities and procedures of the SIU; Review technical-administrative, economic-financial and operational information related to SIUs; and Integrates and aligns with other state projects, programs and actions Evaluate and validate TRIPs for SIU first level approval

4. SELECTION OF SUBPROJECT PROPOSALS

All institutions to implement the project are to be selected on a competitive basis based on criteria as below. BNDES will conduct the selection of pre-proposals, through a public call for both the state-level implementation and the and the PMEL Unit. After this selection, the institutions will present a consultation letter (BNDES “Carta Consulta”) to the EE, and this document will go through a deeper analysis by BNDES technical team before it is submitted for final approval by the bank’s Board of Directors. The final selection will also have IFAD’s no objection. (as per 4.3 below). The process will consist of the following steps:

4.1. Formulation of subproject state-level technical proposals (carta consulta)

At this preliminary stage, technical proposals (carta consulta) will be drafted according to a simplified template. State-level subprojects to be financed, will prepare technical proposals on the basis of “carta consulta” (technical proposal) to the BNDES. The relationship between the loan and grant funded activities for components 1 and 2 of each subproject will mirror exactly the relationship for the overall project for components 1 and 2. BNDES will publish all the instructions for the formulation of proposals, after IFAD’s no-objection.

These proposals shall include geographical targeting, priority activities and key targets to be achieved, duly aligned with the targeting criteria, intervention approach and logframe indicators of the PCRP. The proposal shall also include project management arrangements. The final selection of the proposals will be based on verification of: borrowing capacity, poverty¹⁵ characteristics according to the project’s focus and targeting, climate vulnerability index, counterpart contribution capacity, and implementation capacity (previous experience with IFAD project will be considered).

Regarding the Knowledge Management (KM) Component 3 (Sub-activities 3.1.2.1, 3.1.2.2, 3.1.3.1), it will be contracted under selection process by BNDES following the “carta consulta” procedure. It will be a competitive public call for the execution of a predetermined work plan and budget utilizing, i.e., simplified templates for selection and consultation letter for the selected one(s).

4.2. Qualification of the implementing agencies

The first step of the selection process will consist of credit and legal analysis of the borrower, in the case of the state-level subprojects. It will be verified whether the subproject proponent meets BNDES domestic borrowing criteria. In the case of the KM Subproject, the proponent’s documentation will also be analysed to evaluate its legal and institutional capacity to be a grant recipient. BNDES will conduct a selection of pre-proposals, through a public call for both the state-level implementation and the the PMEL Unit.

The states’ selection process will be based on client qualification, verification of borrowing capacity, poverty characteristics according to the project’s focus and targeting, climate vulnerability criteria,

¹⁵ In the case of poverty level, CadÚnico (Cadastro Único) will be the main system utilized..

counterpart contribution capacity, implementation capacity, social and economic indicators and implementation arrangements.

At a preliminary stage, the states that participate in the public call would be ranked through an analysis based on the following criteria:

- (i) verification of borrowing capacity;
- (ii) verification of counterpart capacity;
- (iii) client qualification;
- (iv) Incidence of rural poverty;
- (v) Climate vulnerability index and historical exposure to drought;
- (vi) Food and nutritional security index;
- (vii) Water quality and availability;

Points may be awarded to states with prior IFAD project experience or other similar implemented projects as this will prove the project capacity and increase readiness. Two to four northeastern states will be pre-selected as eligible to present a State Proposal (Carta Consulta) to the Executing Entity (EE) – BNDES.

Similarly, the institutions and organizations that participate in the public call to implement activities of PMEL would be ranked through an analysis based mainly on the following criteria, and after that the pre-selected one(s) will be eligible to present a Carta Consulta to the EE:

- (i) client qualification;
- (ii) experience with knowledge management and south-south and triangular cooperation;
- (iii) experience with similar projects and themes as contained in the FP's component 1 and 2;
- (iv) experience with implementation of similar budget;

4.3. Technical analysis of subproject proposals

For both processes, after the selection of the eligible states and organizations for the PMEL, BNDES will publish all the instructions and selection criteria for the formulation of consultation letters. .

This proposal qualification and selection will follow BNDES' internal objectives, functions, policies, and procedures, which include a thorough technical analysis, and will be subject to BNDES Board of Directors approval before the signature of the agreements with the states and sub-grant agreement with the PMEL's organization. The final selection will have IFAD no objection.

The consultation letter (Carta Consulta) to be submitted by interested states, includes, among others, information on states qualification and experience, governance and implementation arrangements, geographical targeting, priority activities and key targets to be achieved, duly aligned with the targeting criteria, intervention approach and logframe indicators of the PCR, selected municipalities, as well as compliance with applicable legislation..

The relationship between the loan and grant funded activities and results for components 1, 2 and 3 will mirror exactly the relationship for the overall project for components 1, 2 and 3. Each one must proportionally mirror all components of the Project. Therefore, state projects will differ mainly in the definition of territories and geographic areas (and thus also in overall size), as well as the specificities that may arise from the environmental characteristics of those territories. This design will also be part of the Carta Consulta that will be submitted to BNDES.

5. SUBPROJETS DESIGN AND HIRING

5.1. Design preparation

Eligible semiarid northeastern states will present for approval a *carta consulta* (proposal) to the EE (BNDES) including information on governance arrangements, targets, and compliance with applicable legislation. The selection process will be based on client qualification, verification of borrowing capacity and implementation arrangements, as well as project analysis with predefined criteria

Each subproject must proportionally mirror all components of the Project. Therefore, subprojects will differ mainly in the definition of territories and geographic areas (and thus also in overall size), as well as the specificities that may arise from the environmental characteristics of those territories.

The subprojects that foresee activities with indigenous or other traditional communities shall conduct compulsory prior consultations with those communities in line with the PCRP.

After submission of the “carta consulta” to BNDES, internal processes of approval will be followed according to BNDES’s norms in force at the time of evaluation. After BNDES approves a proposal, the contracting phase starts, in which the state(s) must comply with contractual conditions for successful conclusion of the agreement. IFAD will provide its non-objection to the state financing agreements.

5.2. Criteria for selection of municipalities

Each subproject proposal shall indicate a selection of beneficiary municipalities based on the following criteria:

- (i) Incidence of rural poverty;
- (ii) Climate vulnerability index and historical exposure to drought;
- (iii) Food and nutritional security index;
- (iv) Water quality and availability;
- (v) Presence of at least one Agricultural Family School;
- (vi) Presence of schools;
- (vii) Presence of other relevant projects or programs that can contribute to strengthen project activities;
- (viii) Contiguity (or at least proximity to each other) of municipalities for effective and efficient implementation.

For the incidence of rural poverty, Cadúnico (Cadastro Único) will be the main system utilized. Climate vulnerability index and historical exposure to drought will use the database of the National Commission to Combat Desertification and Mitigate the Effects of Drought, the Warning System Tools for early detection of Drought and Desertification in the semiarid regions in Brazil, and the Resilience Scorecard and Index developed for the PCRP (see Appendix 4 of the PIM). Food and nutritional security index will use the MAPAINSAN 2014 study and the National System of Food and Nutrition Surveillance – SISVAN. Water Quality and availability – based on data from Ministry of Citizenship

5.3. Criteria for selection of beneficiary groups

In each selected state, eligible communities will also be selected, including rural and traditional communities, as well as rural settlements land credit beneficiaries, etc. The state-level implementing unit (SIU) will validate compliance with selection criteria from a pre-selection and validated list in a workshop organized by each subproject's TA team. BNDES will verify the application of the selection criteria and make the final approval. It is expected broad participation of representatives of all related public institutions and agencies (state and local governments, public companies, etc.), and private (nongovernmental organizations, projects, TA companies, private sector, etc.), and other relevant actors that work in the rural area. From analysis of each community's reality and the application of criteria, it will be possible to establish a list of eligible communities.

Based on the list of communities, the state SIUs will carry out field visits in each community to: i) confirm the information provided during the selection workshop; ii) present the project's objectives and methodology; and iii) verify the community's interest in participating in the project; iv) verify the proposed activities' capacity and potential for implementation. Based on this information, a list of the participating communities in each municipality and state will be prepared. This is an important procedure, because there is a lack of disaggregated data by communities.

The main criteria include:

Eligibility Criteria

- (i) Rural families living in the selected municipalities;
- (ii) At least 70% of the members registered on the CadÚnico or Unified Registry (i.e. considered as poor or extremely poor);

Prioritization Criteria

- (i) Exposure to climatic shocks and climatic vulnerability;
- (ii) Access to water for human consumption;
- (iii) Access to water for agricultural production;
- (iv) Sufficient land access to allow implementation of Project activities (particularly for components 1 and 2)
- (v) Families headed by women;
- (vi) Traditional communities such as artisanal fishermen and *“fundo de pasto”*;
- (vii) Indigenous communities;
- (viii) **Quilombola** communities;
- (ix) Communities with collective areas;
- (x) Rural settlement communities that have received land credit;
- (xi) Presence of young people especially those without access to land (also for activities of Component 3);
- (xii) Proximity of communities to facilitate formation of groups of four communities that will form a territory (unit of action of each technician);
- (xiii) Potential to implement project activities, in particular, the Climate Resilient Productive Systems;
- (xiv) Presence of desalination facilities with area available to develop biosaline agriculture;
- (xv) Community organization; and
- (xvi) Evidence of nutrition problems.

Once the SIU has identified and proposes the communities, families will be selected following the procedures described in the chapter of this project implementation manual: “Legal basis for projects operation and selection of beneficiaries.” The final decision on communities and families will be of the BNDES.

Eligibility criteria for Sub-activity 1.1.4.2. Promote local entrepreneurship for products and services that support family farming to be developed.

6. PLANNING AND IMPLEMENTATION

6.1. SIU composition

Each SIU team shall be composed of the following core positions, to be hired according to the TOR contained in Appendix 03:

- Project Manager *
- Project Assistant
- Procurement Specialist *
- Accountant Specialist *
- Technical Analysts *
- Financial Management Specialist *
- Agroforestry and Resilient Production Specialist *
- Youth, Gender and traditional communities Specialist *
- Communication and Knowledge Management Specialist *
- M&E Specialist *
- M&E Analyst

The appointment to the key SIU positions marked with an asterisk * above will be subject to prior no-objection from IFAD, even in case of possible substitutions, for which there must be justification of the reason for the change.

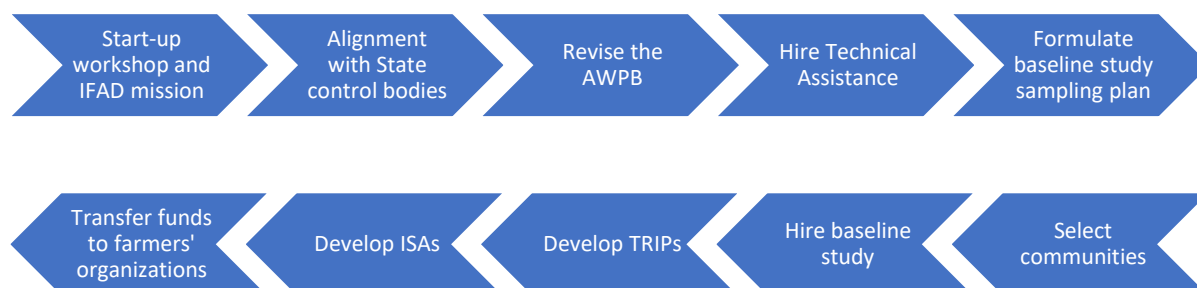
The appointments to positions that will be assumed by civil servants, as managers or coordinators, will be the responsibility of the Secretaries of the borrowing States, observing the procedures adopted by the State Governments and the professional profiles defined for each of the functions in Appendix 03. Positions not composed of servers will be subject to open and competitive selection.

6.2. Start-up procedures

The Financing Agreement (FA) and Guarantee Agreement (GA) enters into force once it is signed. This is a key milestone, as it defines the starting date for eligibility of expenditure for project activities. The next important milestone is the date that additional disbursement conditions are fulfilled, indicated in the FA, which defines the moment the Borrowers may start withdrawing significant amounts of funds from the loan and grant accounts for operational activities. Therefore, project start-up activities are important to help establish operational and fiduciary systems, recruit technical assistance and build the capacity of key project implementers. Effective start-up procedures translate into project implementation readiness.

IFAD and BNDES will organize a start-up mission at CPMU level aiming to coordinate technical implementation strategy, align financial, procurement and monitoring procedures, and support the subproject selection process.

Figure 4. First-year timeline for state-level subprojects



At subproject level, BNDES will hold project start-up workshop in each of the participating states, to which IFAD will field a start-up mission and workshop. All participating states shall participate with a selection of the SIU teams, civil servants and representative local stakeholders. The workshop will be conducted soon after the participating states will have been selected. The purpose is to re-confirm a clear and common understanding of the project objectives and goals, the different phases and stages of the project cycle; to clarify the roles and responsibilities of the entities involved in implementation; and to clarify the legal and financial conditions in the financing agreement, and the associated procedures and responsibilities.

The start-up workshops also provides the opportunity to describe and discuss the project management arrangements and tools, especially the use of Annual Work Plan and Budgets (AWPBs), the implementation strategy set out in the PIM, IFAD and BNDES' policies, the fiduciary and reporting requirements and the M&E arrangements for setting targets and monitoring progress against them. In addition, the start-up workshop clarifies the procedures of official supervision reviews and implementation support towards project improvements. The start mission also presents an excellent moment to hold an operational and procedural alignment meeting with state control bodies.

6.3. Project Planning

The main planning tool for the project is the AWPB. By the **30 September each year**, SIUs must send drafts so that the CPMU can prepare the project AWPB and send for IFAD's review, containing the consolidated planning of all subprojects for the following year. The planning process must include the participation of the procurement, finance and monitoring teams.

The AWPB needs to contain at least the following information:

- Implementation progress and performance (physical and financial);
- Constraints and problems from previous year, and recommendations to resolve them;
- Detailed information on SECAP compliance;
- Lessons learned and rationale for the activities proposed, especially if diverting from the Project Design Report;
- Project strategy and focus for the coming year, by component;
- Procurement performance and issues

- Detailed Annual Budget, by subproject and component, with summaries
- Annexes:
 - Updated Logical Framework
 - Procurement Plan

6.4. Hiring of technical assistance

Once IFAD provides its No-Objection (NO) to the AWPB, including the Procurement Plan, the subproject SIUs shall immediately initiate the procedures to hire the technical assistance (TA) providers. This is a crucial step for each subproject to start the field activities. The TA providers will allow for the SIUs to access communities in order to select them, confirm their interest, and effectively participate of the planning of productive investments.

Brazil's legislation provides a flexible and unique mechanism to hire rural TA. The Ministry of Agriculture, Livestock and Supply (MAPA) already accredits most TA providers (more information in section 8. Procurement and Contracts Procedures). In addition, in the NEB region there are many and highly capable TA entities, much of which have provided services for IFAD funded projects. The subprojects shall plan some training sessions and/or methodology levelling technical workshop at start of a TA contract, with all professionals involved, to guarantee the methodological alignment of the TA services provided in the field.

6.5. Design of TRIPs and ISAs

The state-level subprojects will be organized in rural territories, each of which will be composed of four communities with their own investment arrangements. Therefore, after the communities are selected (item 5.3) and confirmed with the support of the TA, the SIUs shall propose the territories and support the design of their respective investment plans, through which beneficiaries will be able to access project resources, according to the CPMU guidelines and final decision. There will be no further beneficiary selection process once communities are selected. All person belonging to the selected communities will be eligible to participate in the PCRPs and will be invited to participate in the development of the TRIPs.

Territorial Resilience Investment Plans (TRIPs)

A TRIP will be drafted for each geographical area or "territory" consisting of four contiguous or nearby communities represented by an organization. Using participatory methodologies, the TRIP will be built on a diagnosis of the territory's environmental, social, productive status, identifying the territory's strengths and weaknesses. TA teams will design TRIPs with full involvement of beneficiaries based on the Manual for Designing Productive Investment and Business Plans.¹⁶ Based on the diagnosis, activities will be planned, including investments and TA services. Depending on the interests of each family, groups of families with similar interests will be identified to access a particular activity.

One of the four organizations will be chosen as Lead Organisation to legally represent the territory and receive the project's non-reimbursable resources on behalf of all four. The selection of this organization must be based on its institutional capacity to develop the TRIP and manage resources. Nevertheless, participation from the three other organizations must be guaranteed by their participation in specialized committees made up of members of all organizations on equal terms, for instance:

¹⁶ A methodology developed by IFAD with support from the knowledge management SEMEAR International Program.

- Coordination Committee
- Procurement Committee
- Accounting Committee

Once designed, the TRIPs will be submitted to the Consultative Council of the subproject for validation, prior to the CSIU's clearance and submission for the CPMU final approval.¹⁷ If a TRIP agreement exceeds the thresholds established in the procurement section of the PIM and the Letter to the Borrower, the approval process will also require IFAD's prior NO. After approval, an agreement will be drawn up between the SIU and the Lead Organisation, detailing for each organisation the activities to be carried out with the project's non-reimbursable resources, the beneficiary contribution, and the time frame.

The beneficiaries will finance part of the cost of the TRIP investments as a counterpart contribution. This contribution will be at least 10% and may come from financial resources or from the provision of economically measurable goods or services. It must be a new contribution to the TRIP, and may thus not consist of goods or infrastructure that already exists. In the case of investments made in the family, the investment value per family may not exceed USD 3,500. For investments exceeding this amount, a prior NO from IFAD will be necessary.

Investments in Systems of Agroforestry (ISAs)

From the formulation of the TRIPS, an "*Investimento em Sistema Agroflorestal (ISA)*" or Investment in Systems of Agroforestry is to be carried out for each of the communities that integrate them. These are divided into four different types:

ISA – Família (Family): These investments will aim at reducing the vulnerability of production to droughts and at increasing income, by developing a progressive intercrop culture of multiple sustainable uses of the productive areas. A typical example of such a production system would be agroforestry with integrated livestock production. It is intended for the beneficiary families that have plots with an average of 1/2 hectare each, and already have water for production.

ISA – Quintais (Backyard): This type of ISA aims at developing irrigated, diversified productive backyard gardens in conjunction with water investment activities from Component 2. The ISA – Quintais will apply CRPS principles to reduce families' food insecurity from droughts, increase access to nutritious food as well as value and strengthen the role of women in production. It is intended to the beneficiary families that do not have water for production. For this reason, it aims at installing a small-stage irrigation system on a plot of about 0.2 ha. The beneficiaries will receive water access investments from Component 2.

ISA – Coletivo (Collective): These ISA investments aim to develop a slow and progressive culture of multiple and sustainable uses of the Caatinga and reduce extensive grazing, while increasing income, encouraging family succession, and conservation and recovery of the ecosystem services offered by the Caatinga. The system will stabilize and, if possible, increase the supply of forage. The enhanced ecosystem services help ensure that the community will be the main stakeholders in the conservation and recovery

¹⁷ Each state may set up a Consultative Council meetings to evaluate the plans presented to the program to ensure their quality, in the various relevant scopes (alignment with program objectives, feasibility, etc.). This body may request additional information or recommend improvements, clear or reject a proposal that is considered inappropriate.

of the system in which they live in. Therefore, it is intended for communities that have a collective use area of at least 500 hectares. The design of these ISAs will have to consider the following activities:

- Recover degraded areas using CRPS;
- Decrease timber demand by implementing eco-efficient stoves and biodigesters;
- Increase supply and efficient use of water for production;
- Structure community seedbanks and nurseries;
- Promote low-impact productive activities in collective areas (e.g., beekeeping); and
- Strengthen community governance of access and sustainable use of the areas.

ISA – *Escola* (School): The aim of these ISAs is to enable rural educational institutions for youth to experiment and teach to students CRPS, rational use of water for production, renewable energies, and other resilient practices. This also involves working with the cooks who prepare school meals, by encouraging them to use native fruits and vegetables, thereby reinforcing children's food and nutritional security. This type of ISA will be directed at rural schools, preferably Family Agriculture Schools (EFAs), located in the vicinity of the participating communities. The ISA's design will have to consider the following activities:

- CRPS teaching and experimentation, including courses on climate change, natural resource management and practices based on the principles of agroecology;
- Development and maintenance of nurseries and seedbanks;
- Promotion of entrepreneurship in CRPS; and
- Training for cooks and students on the nutritional value of native fruits and vegetables to diversify and enrich diets.

For schools to benefit from ISA – Escola activities, the following criteria must be met:

- (i) Schools must operate in the communities participating in the Project;
- (ii) Schools must have sufficient area available to implement CRPS or water access activities;
- (iii) Schools must have the possibility of developing follow-up activities with the students' families.

7. BUDGETING AND FINANCIAL PROCEDURES

The project's general financial management will be carried out by BNDES, in the role of CPMU. The CPMU will carry out the technical and financial coordination of the project together with the subproject implementers. Implementers should have technical staff responsible for managing resources and providing technical, physical and financial reports to the CPMU, which will report to IFAD, which in turn will submit the reports to GCF. Within the CPMU, BNDES' financial sector will be responsible for execution of the financial arrangements established under IFAD's disbursement, reporting and audit manuals to ensure proper financial management and implementation.

Financial administration and implementation procedures are detailed in Appendix 01 and 02 of the PIM, to assist CPMU and the SIUs to carry out the project's administrative and financial management to high standards, and to promote compliance with operating policies. The Appendices include information on flow of funds, procedures for requesting and releasing resources, payment to suppliers, requests for disbursements, financial and accounting records, financial reports, authorized signatures, accountability, financial execution supervision, use of income by projects and beneficiaries under their agreements, and project and beneficiary counterparts, among other things

8. PROCUREMENT AND CONTRACTS PROCEDURES

8.1. Procurement Systems, Rules and Procedures

Procurement of goods, works and services financed by the project will be carried out in accordance with the Procurement Law of the Federative Republic of Brazil (Law nº 8.666, from 1993) and its amendments, given that they are consistent with the provisions of IFAD's Project Procurement Guidelines and Handbook and its amendments.

According to the World Bank's assessment¹⁸ of the national procurement methods of 2010, Brazil complies with international standards in terms of: (a) legislative and regulatory framework; (b) institutional framework and management capacity; (c) procurement operations and market practices; and (d) integrity and transparency of the public systems. Therefore, the project shall use of national and state-level procurement systems, applying the rules and procedures established on the current legislation.

According to Brazilian Law No. 12,188 of 11 January 2010, Rural TA services can be hired through a public call for proposals, in which only entities accredited by MAPA (ANATER)_ can participate. The process is similar to the Selection by Fixed Budget (SOF) method, although the number of entities is much higher than the short list of the SOF, which favours competition and the service of all regions of the target audiences of the Projects. IFAD acknowledges and recommends the use of this method.

Nevertheless, national and international bidding processes, as well as all contracts established under the aegis of the project, must always contain IFAD's clauses on Anti-Fraud and Corruption Provisions, as well as Sexual Harassment and Sexual Exploitation and Abuse. The prior review arrangements, determined by thresholds of the estimated value of the contract and other variables, as well as the phases of each process that require IFAD's non-objection, will be fully detailed in the letter to the borrower. Each year, as part of the AWPB, the CPMU will submit to IFAD for approval a procurement plan containing a compilation of the procurement planning of each subproject.

8.1. Sexual Harassment and Sexual Exploitation and Abuse Clauses

IFAD requires that the recipients of its financing observe and ensure that others observe the provisions for the prevention of "Harassment And "Sexual Exploitation and Abuse", including in all agreements and contracts within the scope of the Projects financed with its funds, whether by the project's team, contractors, suppliers and other third parties, under the following provisions:

The borrower, beneficiaries or parties involved have an obligation to report immediately to IFAD incidents in IFAD-funded activities or operations relating to Sexual Harassment and Sexual Exploitation and Abuse.

IFAD applies the definitions of the United Nations, which state that:

- "Exploitation and sexual abuse of beneficiaries in the context of IFAD operations are defined as any actual or attempted abuse of a position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, monetary, social or political profit from sexual exploitation

¹⁸ 2010. World Bank. Assessment of the Procurement Systems of the Brazilian Federal Government and the Brazilian State of São Paulo: in support of a use of country system pilot project in procurement in São Paulo State.

of others (sexual exploitation); real or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions (sexual abuse).”

- “Sexual Harassment is any unwanted sexual advancement, request for sexual favour or other verbal, non-verbal or physical conduct of a sexual nature that irrationally interferes with work, changes or is an employment condition, or creates an intimidating work environment, hostile or offensive. ”

8.2. Anti-fraud and anti-corruption clauses

Moreover, all contracts must contain the clauses combating fraud and corruption, as follows.

In the case of an IFAD-financed contract, if the CONTRACTING PARTY finds that the CONTRACTED PARTY has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices during the selection or execution of the contract, the CONTRACTING PARTY may, after notifying the CONTRACTED PARTY within a period of 14 days, terminate the agreement, considering the definitions presented below:

- (i) **"Corrupt practice:"** means directly or indirectly offering, giving, receiving, or soliciting anything of value to influence public servant action in the bidding process or contract execution;
- (ii) **"Fraudulent practice"** means falsification or omission of facts in order to influence the bidding process or execution of the contract;
- (iii) **"Collusive practice"** means to plan or establish an agreement between two or more parties, with or without the knowledge of the Borrower or its Prosecutors, to set prices at artificial and non-competitive levels;
- (iv) **"Coercive practice"** means causing harm or threatening to cause harm, directly or indirectly, to persons or their property to influence their participation in a bidding process or affect contract performance.
- (v) **"Obstructive practice"** means:
 - (a) Destroy, falsify, alter or conceal evidence in inspections or make false statements to auditors for the purpose of materially preventing an IFAD inspection of allegations of corrupt, fraudulent, coercive or collusive practice and / or threatening, harassing or intimidating any interested party to prevent it from showing its knowledge on matters relevant to the investigation or its continuation, or
 - (b) Acts intended to materially prevent the exercise of IFAD's rights to promote inspection or audit.

Measures to be adopted

1. IFAD will cancel the loan or grant portion of the contract if at any time it finds that the representatives of the Borrower / CONTRACTING PARTY or a beneficiary of the loan are involved in corrupt,

fraudulent, collusive or coercive practices during the selection process or without the Borrower/contractor having taken timely, appropriate and satisfactory remedial action to IFAD;

2. IFAD shall impose sanctions on the consultant and may declare the consultancy ineligible, indefinitely or for a limited period, for the award of an IFAD-financed contract, if at any time IFAD finds that the consultant has engaged, either directly or through an agent, in corrupt practices, fraudulent, collusive or coercive when participating in selection process or contract execution.

Inspection and auditing

The CONTRACTED PARTY shall allow IFAD and/or IFAD-designated persons to inspect its accounts and records related to performance of the contract and submission of its proposal and/or curriculum, and the CONTRACTING PARTY shall permit such accounts and records auditors appointed by IFAD if the Fund requires so.

8.3. Procurement Plan

The purpose of the procurement plan is to plan and manage details of acquisitions and contracting that will be carried out during the project's execution period. The initial procurement plan has a programming timeline of 18 months, while the next ones will be elaborated for a period of 12 months.

Procurement of goods, services, works and consultancies (from either legal entities or private individuals) may only be tendered when they are included in the project's procurement plan with prior approval from BNDES and IFAD.

Bids not included in the agreed procurement plan will not be financed from project resources. Likewise, bids made by methods different from those described in the procurement plan cannot be financed with project resources.

Among other regulations, the bidding processes establishes that:

- i. Any inconsistencies related to procedures and methods set out in the procurement plan will result in IFAD's objection to the request.
- ii. For all categories, the procurement method is based on the rules and procedures for acquiring goods or services and selection of consultants described here, within the limits of established values and the nature and complexity of the service, taking into account the national legislation and the principles set out in the IFAD procurement manual.
- iii. Procurement proposals shall contain, in the Term of Reference, the specifications, data and/or documentation necessary for procurement of inputs or performance of services.
- iv. The consulting proposals should contain, in the Term of Reference, the products, related activities, and execution/delivery schedule of the products.
- v. The terms of procurement and consultancies are established according to the stages of each bidding method, defined in the procurement plan.

Content of procurement plan

The procurement plan shall include:

- i. Brief description of goods, non-consulting services, and works to be procured and consultancies to be contracted, observing the Project's eligible expenditure categories;
- ii. Each contract's estimated cost;
- iii. Applicable procurement and selection method;
- iv. Applicability or not of prior review;
- v. Schedule for each step of procurement and selection procedures;
- vi. The financial limits of each method; and
- vii. Confirmation no goods or services to be procured finance SECAP/ESS Category-A investments.

Updates of procurement plan

The procurement plan is a dynamic planning and management tool that can (and should) undergo annual revisions and updates throughout project implementation (or even more frequently if needed). All changes will only be effective after IFAD's no-objection. Subprojects' Procurement Plan for the following year shall be delivered to CPMU by **30 September each year**, as an annex of the AWPB. The CPMU will compile all subprojects' documentation and submit it to IFAD by **31 October each year**.

8.4. IFAD's prior review

Prior Review Thresholds¹⁹

The following are subject to IFAD's prior review:

- a. the award of any contract for the acquisition of goods for USD 200 000, its equivalent or more;
- b. the award of any contract for the acquisition of works for USD 200 000, its equivalent or more;
- c. the award of any contract for the acquisition of services for USD 100 000, its equivalent or more;
- d. the award of any contract and/or agreement with the communities and/or beneficiary organizations for USD 100,000, its equivalent or more;
- e. the award of any individual consultancy contract for USD 50,000, its equivalent or more;
- f. any process of direct purchase or contracting.

Note: The first process of each new procurement method used by each of the subprojects, will require IFAD's prior review, in order to evaluate its adequacy.

¹⁹ In the case of any differences between this version of the PIM and the Letter to Borrower, the provisions of the latter shall prevail, as well as any further adjustment approved by IFAD.

Prior Review Stages

- 1) Term of Reference or technical specifications, and bidding notice, if applicable in the method chosen, accompanied by the cost estimate: spreadsheets with person/hour value (if consultancy services) or average of three budgets (if goods, non-consultancy services or works/reforms).
- 2) Evaluation/adjudication reports or calculation maps with adjudication and contract draft, or purchase order / service (in the case of services: the technical evaluation will be submitted for NO first, followed by another request for NO for the overall evaluation including technical and financial evaluation).
- 3) Contract completed after homologation of the bidding, but without signatures (after no objection, the signature is provided and a scanned copy is sent to IFAD).

8.5. Individual Consultancy Contracts

For individual consultancies, two types of hiring can be observed:

- a. **The Global Price Contract** - Global price consulting contracts are mandatory for products. This contractual modality must be used whenever there are specific products to be delivered, against which payments will be made. Example: elaboration of a study on protection of a spring, elaboration of a plan to revitalize degraded area, etc. Products are partial or total deliveries (if only one) of the object of the contract. The Term of Reference of this contractual modality clearly contains the object, with a specific field to inform the products that must be elaborated (with title and description of each one), containing the respective activities to be carried out for the elaboration of each product and with schedules informing preparation period and deliveries for payment. The duration of this contract must be calculated based on the time necessary to prepare each product, deliver it for review, contractor analyse and make returns and/or approve and provide payments. This type of contract can only be subject to the addition of a period and with an adequate justification for the delay in the preparation and delivery of the products, subject to IFAD's no objection.
- b. **Contract for Time** - The consultancy contracts for time are mandatorily paid through monthly activity reports that measure the hours worked for each respective activity performed in the month and provided for in the Term of Reference. These reports should not be called products. The Term of Reference of this contractual modality clearly contains the object of the advisory, and informs all possible necessary activities that the contractor must carry out monthly. In this Term of Reference there is no field "products to be delivered", only a field that informs the payment method conditioned to the delivery of a monthly report describing the activities carried out, which must be reviewed by the contractual manager and approved. Whenever applicable, proof of the activities must be attached to the reports. This type of contract should be used to hire a team of consultants who will support the Project Management Units, such as a consultant to support the Monitoring and Evaluation area, the Bids and Contracts area, the financial area, etc. This contractual modality must provide in the contract (and / or in the Term of Reference) performance evaluation, which will indicate the possibility or not of contact renewal. The terms of these performance evaluations can be quarterly, or half-yearly or annual. These contracts can be renewed until the end of the project, if the contracted activity is necessary.

NOTE 1: individual consultancies contracts cannot contain punishment clauses, either for time or for a global price. The punishment is the non-payment of the poorly prepared product (global price contract) and non-contractual renewal in the case of negative performance evaluation).

NOTE 2: individual consultancies contracts must contain the Anti-Fraud and Corruption Clauses.

8.6. Document recordkeeping

The documents for each stage of the bidding process (contracts, invoices, receipts, and other documents indicating eligible expenses) must be kept in perfect chronological order, duly registered to be made available at any time for routine audits and verifications by BNDES and IFAD.

Documents should be available for at least 10 years after project closing, or 10 years after submission of the last audit report to IFAD.

9. AUDITING

IFAD has an obligation to its financial management department to ensure that resources from lending operations be used economically, efficiently, transparently and solely for the purpose set forth in the loan or grant agreements. Audits must also verify the project's compliance with the commitment regarding the non-financing of SECAP/ESS CAT A investments.

At a minimum, supporting documentation and financial and procurement records must be properly maintained from start of project until the closing date established in the item "**documentation records**," as they will be subject to verification by audits.

The external audits will be carried out by the contracted company, and the internal audits will be the responsibility of State Controllers, who will annually insert in their planning the scheduled audits for evaluation.

Audits will be carried out based on financial records, which will contain the segregated information, such as payment orders and expenses incurred by category of expenses and by component.

All the documents related to the bids and contracts must be well organized and kept for analysis of the audits, and there must be individualized control for each bid, with the opening of administrative processes, which must be chronologically instructed and assessed (paginated and initialled).

All assets acquired must be made available throughout the duration of the project for audit verification and must be properly identified.

Auditing will be conducted under terms acceptable to IFAD, and the audit report will meet all the terms of the revised TOR approved by IFAD in accordance with International Standards on Auditing (ISA). Each project's accounts must be audited each fiscal year. The audit report should be submitted to IFAD for review and approval by **June 30** of each year, in English or Spanish, which are IFAD official languages. IFAD will review the audit report and periodically determine whether the recommendations are being implemented satisfactorily.

The annual audits shall include analysis and issuance of separate written opinions on: (a) the project's financial statements; (b) the management of the Designated Account/s; and (c) the Withdrawal Applications.

When an independent audit is contracted, the firm will be contracted through the national comparison of prices (shopping), with standard TOR approved by BNDES and IFAD. The winning firm may act for four consecutive years, but in the fifth year of the project, there must be a new bidding process for another firm to perform the audit.

10. MONITORING, EVALUATION AND LEARNING

10.1. Planning, Monitoring, Evaluation and Learning System (PMEL)

A Planning, Monitoring Evaluation and Learning System (PMEL) will be developed to allow the results-based project management. A specific PMEL Unit will be established to carry out PMEL tasks under subcontract from BNDES. The data and information collected through the use of specific tools for the implementation of CRPS, will contribute not only to learning, feedback and improvement of project interventions but will also build the foundations for the material relevant to the knowledge management (KM). The PMEL will be a fundamental tool to the CPMU decision making and will be in particular useful to provide feedback to the SIUs at the state level. In addition, the systematization and dissemination of good practices and successful experiences will be important to define and design South-South cooperation schemes, advancing concrete results.

The design of the PMEL is based on the experience of practices and methodologies applied in previous IFAD operations in Brazil and in other countries in the region. The planning and monitoring tools will favour participative practices both in their intervention at the level of TRIPs, communities, as well as in the Project management.

In order to manage the state level information, the Country-based Monitoring and Evaluation system (DATA-FIDA), developed and implemented for the ongoing IFAD Brazil portfolio will be used and customized for the PCR. The system has been developed by Programa Semear Internacional (PSI) and all projects in Brazil have been trained on its use. It is a project-supporting tool for organizing the information so that it reflects the implemented activities contribution both to the Logical Framework (LF) and to the project AWPB. Each state-level SIU will carry out the physical and financial monitoring of the implemented activities in its respective state using the DATA-FIDA system and will report to the CPMU to monitor the implementation of the project as a whole. The CPMU will be assisted by the PMEL Unit. During the first year of project implementation, improvements will be made to the DATA-FIDA system to allow the aggregation of the state data and its handling by the CPMU; in addition, an interface will be implemented for DATA-FIDA to dialogue with the IT system of BNDES. The CPMU will be responsible for preparing and sending to IFAD the required consolidated progress reports and other project information, based on information provided by the SIUs. IFAD will be responsible for preparing and sending the progress reports to the GCF, in collaboration with BNDES.

10.2. Focus and objectives

The PMEL objective is to generate learning for the project implementation and evidence on the results on changes in the quality of life of vulnerable groups, communities and regions in which the Project will operate. The PMEL will be developed in a participatory manner including all the actors involved, to promote the ownership of the used instruments and procedures.

10.3. Planning

It will be undertaken at a strategic and operational level. At the strategic level, the state project authorities' participation will be promoted for a preliminary mapping of the area of intervention in each state. In these selected areas, the participation of SIUs will be important, to initiate the Project actions with the selection of municipalities and beneficiary groups with the highest socioeconomic, climate and environmental vulnerability. The SIUs that will have on board, both an M&E specialist and an analyst, will be responsible for the preliminary mapping of this planning exercise to be aligned with the objectives and goals defined in the ML and the Project design document.

At the operational level, the AWPB will be prepared annually by the state-level SIUs defining for each subproject a logical and coherent set of activities that will be carried out each year, which the CPMU will consolidate into a single document. The project's AWPB will be composed of systemic or wide ranging activities such as the proposed in Component 3, as well as those of a territorial nature, limited to the specific realities in the selected states.

The AWPB preparation and its implementation will be facilitated by the tools available and under use at IFAD portfolio in Brazil for the financial and physical performance (DATA-FIDA) follow up. The AWPB as a project management instrument will facilitate the monitoring for the fulfilment of the activities, the use of resources and the budget execution, and be a continuous evaluation tool allowing informed and timely decision-making to adjust and/or reschedule the Project at any moment during its implementation.

Each state, through its SIU, must participate in the elaboration of its AWPB taking into account the project's final goals. Starting in the second year, the assessment of the results of the previous year will also be considered, to include adjustments in the implementation rates depending on the magnitude of the changes achieved against those projected. The project's consolidated AWPB will be submitted by the CPMU annually for IFAD's no-objection.

If necessary, the LF will be revised at the beginning of the project implementation to ensure that expected results and goals will be consistent with its purpose, as well as checking the validity of assumptions and adjusting the verification means.

10.4. Monitoring

It will ensure the efficient Project performance and the coherence of its physical and financial progress to achieve the planned results. To this end, specific tools will be designed to aggregate data from subprojects and participatory community exercises. These tools will be applied consistently for all the participating

states, for which their development and changes throughout the project life must be carried out with leadership by and in agreement with the CPMU. Complementary, a georeferenced GIS-based monitoring system will be implemented, which will be managed by each state-level SIU, to determine the degree of recovery of the project's intervention areas through GIS-based monitoring studies of vegetation cover and ecological quality in addition to the monitoring of rainfall and temperatures. The adoption of this methodology will make it possible to assess resilience improvements during project implementation and to calculate carbon mitigation. The GIS-based monitoring can also improve the understanding of factors contributing to resilience by overlapping the recovery data, climate data (rainfall and temperatures) with the index for resilience capacities of farming families.

In order to monitor changes in the resilience capacities of farming families, a particular feature of the monitoring of the Project impacts, a resilience scorecard and index have been developed tailored to the project's theory of change. This methodology has a pragmatic approach to dealing with multi-factor complexity. It only focuses on monitoring the resilience capacities the project seeks to address or is likely to influence. It does not monitor absolute resilience, but changes in resilience of the beneficiaries compared to the baseline or control group families. The resilience questionnaire and scorecard may be adjusted in consultation with project stakeholders at project start-up and will be completed as part of the baseline survey, at mid-term and at the end of the project. It should be used for knowledge generation and improved analysis of resilience dynamics by combining it with the GIS-based monitoring studies of vegetation cover and ecological quality and climate data showing if stresses or extreme weather events have occurred during the implementation of the project.

In addition, based on the positive experience of IFAD-supported projects in Brazil, the use of "cadernetas agroecológicas" or agroecological logbooks will be expanded and promoted. This will help to capture the (economic and financial) contribution women make to their households and to identify and address gender inequalities that play out at the household level.

The monitoring must provide timely and reliable information, both at central and state level, on the fulfilment of projected activities in the AWPB, the obtained achievements and the use of the financial resources, with the aim to take decisions at the community, state and project levels and make possible the needed corrections and reorientations during its implementation. For the monitoring of TRIPs, tools that have already been proved in other states with other IFAD projects in Brazil will be adapted to be applied to the PCRPs activities. The project monitoring system will be consistent with the LF.

To carry out the monitoring throughout the project cycle, the state-level SIUs will collect information on the activity and output levels from the beginning of the implementation period, and on outcomes in the form of short questionnaires with a randomly selected subgroup of beneficiaries annually as of the Mid-term Review. These data will be entered into the DATA-FIDA system in a decentralized manner, and checked for consistency by the CPMU. The decentralized data entry is expected to engender local ownership of the data and local progress stocktaking relative to the AWPB and to the TRIPs. In addition, specialized thematic studies will be contracted as part of Component 3 under the PMEL Unit. The CPMU will have an advisory function to guide these services. The CPMU will also be responsible for the development and implementation of new (planning, monitoring, and evaluation) complementing tools deemed necessary along the project life, in coordination with the responsables for the M&E areas of the SIUs.

On the SIU side, it is expected that the development and implementation of the monitoring subsystem will be carried out through the M&E specialists and analysts designated for the project in each participating state. They will require specific training in activities related to DATA-FIDA, the GIS information system management and maintenance, the use of satellite information, georeferencing, etc.

10.5. Evaluation

Evaluation implies an analysis carried out at different moments with diverse scopes and depths, mainly focused on the effects and outcomes of the project, with less emphasis on the implementation of activities or immediate outputs. The project must have a clear evaluation strategy that allows evaluating its contribution to the achievement of the results and impacts defined in the LF. This strategy will be defined at the project's start-up to ensure that the needed information will be collected through the execution. In this sense, the evaluation subsystem will be closely linked to and partly fed by the monitoring subsystem. The evaluation strategy will be developed around three key moments and studies: the baseline study, the mid-term review and the final report (including the results of the impact evaluation study).

Baseline study. Its objective is to describe and analyse the initial situation of the project's target group based on selected indicators of impact and effect related to the Project's expected outcomes in its LF. It will serve as a benchmark for comparison for future evaluations. To this effect, specialized services will be hired to collect needed information for the project activities and in line with the objectives and results to be achieved and that are found in the LF. The baseline survey will be conducted under Component 3 in a consolidated manner for each specific state. The terms of reference for this contracting, as well as the sampling, shall be elaborated jointly and agreed with the CPMU. Previous experience with the grant Adapting Knowledge for Sustainable Agriculture and Access to Market (AKSAAM) with the Federal University of Viçosa (UFV), the Programa Semear Internacional (PSI) grant and other experiences such as with the International Policy Centre for Inclusive Growth (IPC-IG) will be taken into account. The data survey in each one of the states must follow the same methodology. The proposed methodology and the sample must have the IFAD's no-objection. The CPMU will be responsible for overseeing the implementation of the baseline study.

Mid-term Review (MTR). BNDES and IFAD will carry out an MTR by the end of the fifth year of project execution (the date will depend on the state-level of execution of the Project and its total duration). The MTR will be carried out once a contracted survey on the results of the project is finalized, which will present the first advances in terms of outcome indicators. This survey will be carried out with information collected from each of the participating states. The minimum content of the aspects to be considered in the document will be jointly defined by the CPMU and IFAD. This review will also analyze the implementation process and the relevance of the intervention strategies and methodology. The mid-term review report will serve to adjust the orientation of the project.

Impact Evaluation. The final evaluation will be carried out during the last year (year 8) of project execution, by contracting specialized services in the same way as the baseline and the MTR surveys. For the survey, a methodology will be defined (including the sample design) to be consistent with that applied for the baseline of the Project, in order to make an objective comparison of the progress of

implementation and adequate measurement of its impact and results. The proposed methodology and sample must have the IFAD's no-objection. The results of this study will provide inputs for the Project Completion Report (PCR). Previous experiences of collaboration in the area of evaluation, especially of previous evaluation carried out by IFAD projects and methodologies developed through the AKSAAM grant with the UFV, PSI and IPC-IG will be taken into account.

Project Completion Report (PCR). This report will describe the situation at the end of the intervention and will include a description of it, the results achieved in relation to the goals set in the LF and the lessons learned. The report will be prepared based on the results and impact study described above, between the completion date and before the closing date of the loan. The report is a project responsibility and will therefore be prepared by CPMU/BNDES following IFAD's guidelines. IFAD will be responsible for sending the PCR to the GCF, which will be carried out in collaboration with BNDES.

Thematic evaluations on issues such as gender, youth and nutrition and economic results surveys and studies will also be carried out throughout the project execution period, which will serve to analyze the progress of the project and to review its activities. By their nature, these evaluations will be part of the Learning and Knowledge Management subsystem. The Pro-WEAI will be included in the baseline, mid-term and endline surveys.

udies and nevaluations will be part of the Learning and Knowledge Management subsystem.

10.6. Learning and knowledge management

Learning and knowledge management (KM) will be carried out throughout the execution, based on the results of the M&E subsystems, where the lessons learned become inputs to adapt planning and monitoring. Due to the importance of these activities, which are more fully described in component 3, each state will have two specialists in communication and KM.

The Project will also have specific learning and KM activities. The learning products that will be developed as a basis for these activities may be identified in events related to M&E or others, these could be: thematic and methodological systematizations; technical learning notes; technical training; case studies, good practices, horizontal exchanges and exchanges between institutions and communities

The promotion of learning will be done at the community, territory, state, and regional (Northeast) levels, as well as internationally for the benefit of the implementation of PCR in the targeted area. To this end, the CPMU together with the SIUs will develop a communication strategy that considers the different audiences to which the information will be directed and the various communication objectives. It will be crucial to exchange information and experiences with initiatives of a similar nature in other countries, for which reason the Project will place great emphasis on South-South and Triangular Cooperation (SSTC) activities.

Experiences and best practices of previous and ongoing projects in Brazil will be fully considered in order to enhance learning and KM. In this regard, the Dryland Adaptation Knowledge Initiative (DAKI) grant

approved in December 2019 and effective since July 2020 will pave the way for cross-cutting activities in learning and KM, SSTC, policy dialogue and M&E. The experiences developed through AKSAAM and PSI grant will also be considered under Component 3 of the PCRP.

11. IFAD MISSIONS

IFAD can deploy different missions, which have different modalities:

- i) **full supervision mission** that assess the performance of all project's aspects;
- ii) **partial supervision mission**, only assessing some selected aspects of project's performance (e.g. partial supervision mission can be conducted as the second mission for actual or chronic problem projects);
- iii) **implementation support mission** which are less formal and may be more technical in nature
- iv) **mid-term review** mission;
- v) **completion** mission;

One mid-term review (MTR) will be carried out during year fifth year of the PCR. The MTR will recommend a scaling-up or reorientation as may be required to achieve project objectives.

One completion review will be conducted jointly by IFAD and BNDES and will evaluate, among other things, the results and impact of the program, review sustainability and exit arrangement, and draw experiences and lessons for later IFAD and BNDES and state and federal level government supported projects.

IFADs missions will be accompanied by specialized consultants hired by IFAD, as necessary.

11.1. Supervision Missions

The PCRP will be directly supervised by IFAD. For this, IFAD's Salvador Office will play a major role. In order to facilitate the project's implementation and ensure the achievement of project objectives considering the complexity of the operation, IFAD in collaboration with BNDES will conduct at least one supervisory mission per year. Each state level subproject will receive at least one partial supervision mission per year with a resulting aide memoire (Memorandum) signed by IFAD, BNDES and the state. The subproject partial supervision will contain field visits and dialogue with state level authorities and local stakeholders such as civil society, research organizations, private sector, and farmers' organizations, amongst others. These Memoranda will then form the basis of a consolidated supervision report, which will be produced during the annual supervision to the CPMU, which will also comprise of Component 3 and its PMEL Unit. This project-wide supervision mission will also result in a Memorandum signed between IFAD and BNDES.

Supervision missions should focus on identifying implementation bottlenecks and propose concrete solutions, rather than only assessing project performance. In the context of decentralization, which fosters the principle of continuous supervision, IFAD requires at least one full supervision mission every

12 months. Actual problem projects and chronic problem projects are required to have at least two supervision missions every 12 months, of which one must be a full supervision mission; the other can be a partial supervision mission focusing on under-performing aspects. The results of the supervision mission are captured in a Supervision Report generated online in ORMS. Financial management (FM) reviews, procurement reviews and general project management issues are integral to every full supervision mission. Exceptional circumstances may warrant an ad hoc FM and/or procurement supervision, as agreed with IFAD.

The supervision mission, including the partial supervisions to each subproject, will consist, among other, of the following:

- (i) revision of implementation progress, in view of agreed goals and results targets;
- (ii) dialogue about problems identified in the management of the project;
- (iii) field visits to beneficiary families and communities, and meetings with project partners;
- (iv) review of the project's International Finance Reports (IFIs);
- (v) review GCF's Annual Performance Reports (APR)
- (vi) review of the projects Progress Report
- (vii) revision of the issues raised in the audit reports;
- (viii) revision other financial and disbursement reports;
- (ix) dialogue about problems identified in the financial management of the Project;
- (x) Update the financial risk including performance evaluation;
- (xi) revision of the bidding and contract management processes carried out under the Project;
- (xii) Agreements with the project implementers on measures to improve operational, FM and procurement performance of the project.

11.2. Implementation Support Missions

Specific project implementation support missions (ISMs) to deal with specific implementation issues that may emerge during implementation will be critical to ensure targeted support by IFAD and removal of obstacles. ISMs may be organized at a state level subproject or at the CPMU level, when necessary and according to demand. It is expected that about one ISM will visit each state subproject and the CPMU per year.

ISMs provide technical advice (and sometimes training) to implementing agencies. Reporting of these missions is done in the form of Memoranda, and does not include performance ratings, and is not disclosed. However, it is shared with the implementing agencies and partners, and basic information about the nature and objective of the ISM and the Memorandum are captured in ORMS.

IFAD provides implementation support for a wide range of activities, depending on the needs and circumstances of the particular project or country programme. The delivery of implementation support may be reactive (responding to requests by the project implementer) or proactive (initiated at the

suggestion of IFAD), and it may be provided in response to actual or emerging problems and constraints or to prevent identified potential problems from materializing. Implementation support should not replace regular project implementation activities.

Implementation support can be mobilized for individual projects to address project-specific issues, for country programmes to address crosscutting issues in the country portfolio, and for multi-country/regional initiatives to facilitate learning and knowledge sharing. The support may range from assistance in solving complex issues to more hands-on advice or process facilitation, such as refocusing the strategic direction of the project; modifying components or implementation arrangements; and resolving fiduciary issues (FM, procurement) throughout project implementation. It may also support the introduction of innovative approaches and the promotion of good practices and new partnerships.

It is important that implementation support inputs be agreed in advance with implementing agencies, partners and stakeholders.

11.3. Midterm Review (MTR) Mission

BNDES and IFAD will agree to carry out a MTR by the end of the fifth year of the Project execution. The MTR will be carried out once a study on the progress and results of the Project is finalized, which will present the first advances in terms of effect indicators. This mission will be carried out with information collected from each of the participating states. The minimum content of the aspects to be considered in the document will be jointly defined by the CPMU and IFAD. This review will also analyze the implementation process and the relevance of the intervention strategies and methodology. The mid-term review report will serve to adjust the orientation of the Project.

The MTR Mission should be preceded by preparation and delivery of a report specifically designed for this purpose, which is prepared under the guidance of the CPMU. The mission may trigger some contractual modifications of technical content and possibly the term of the Financing Agreement.

12. PROJECT CONCLUSION AND COMPLETION

Project Completion Report (PCR)

This report will describe the situation at the end of the intervention, focussing on the results achieved in relation to the goals set in the LF and the lessons learned. The report will be prepared based on the baseline and impact evaluation surveys described above, between the completion date and before the Financing closing date. The report is a Borrower's responsibility, and will be prepared by CPMU following IFAD's guidelines. Once finalised, IFAD will send the PCR to the GCF, in collaboration with BNDES.

While PCRs remain the ultimately responsibility of the Recipient, IFAD through the Project Development Team (PDT) will facilitate the process, ensuring timeliness and quality of reports, and distilling knowledge. Completion reporting represents the last step in the IFAD-country partnership for the achievement of agreed development outcomes, and therefore it is formally the last step of supervision and implementation support.

The Recipient then prepares the PCR, which: (a) assesses the extent to which the project achieved its objectives and assesses the overall performance of both the Recipient and the Fund; and (b) draws lessons

from this experience to improve the design of future projects, country programmes/strategies, and policies.

IFAD usually starts discussing plans for closing the project with the Borrower during the penultimate supervision mission to allow to discuss those activities needed for the completion which are then included in the last AWPB. The following are the key areas related to project completion to cover during the penultimate and final supervision mission:

- Status of all contracts or activities under implementation and the timing of their completion, so as to align those dates with the project completion date and enable timely payment to all contractors, consultants, and vendors.
- Status of closure activities – finalization of withdrawal applications, recovery and/or refund of advances, refund of any ineligible expenditure.
- Project data collection processes to facilitate the evaluation of project achievements.
- Organization of any impact evaluations.
- The need to inform cofinanciers, stakeholders, and development partners of the financing closing date and make arrangements for closing activities.
- The Borrower's obligation to prepare the PCR, and the timing of the PCR.
- The possible organization of a final mission to assist in gathering relevant data as input to the PCR.
- Arrangements for and timing of the final audit report.

12.1. Timeliness of Project Completion

The Project Completion date is defined as the end of project activities, “on which the implementation of the Project is to be completed.” It marks the end of the project implementation period, and eligible expenditures must be incurred before that date. After that date, only expenditure for winding-down activities will be eligible. The Financing Closing date is defined as the date on which the right of the Recipient to request withdrawals from the Loan and Grant Accounts ends, which is six (6) months after the Project Completion Date or on a later date as IFAD may designate by notice to the Recipient.

The project will have the completion period (the six months after concluding its activities) to document expenditures incurred before the completion date. During this period, the last (independent) external audit will be conducted and paid. Contract expenditures should be planned to be completed by end of project in order to proceed with financial closure

12.2. Final report

Each SIU will prepare, or oversee preparation, and submit to the CPMU, three months after completion, the project's final report, with a detailed set of information and evaluations of all actions undertaken, financial implementation, targets met, project efficiency and effectiveness, evolution of selected indicators and the lessons learned.

The final overall report will be prepared at end of project and will aim to analyse whether or not there are changes in its objectives, structure and goals, whether actual results accomplish the planned results, factors affecting project implementation, the performance of agents involved in project execution, sustainability of results and lessons learned for new projects or operations.

In the project's final evaluation, the following documents, among others, will be analysed:

- a) Project's initial logical framework;
- b) Set of monitoring and evaluation indicators.

13. DISCLOSURE

The project will disclose the relevant documentation developed through GCF design process (including the SECAP and the Gender Assessment and Action Plan) in a timely manner. Category B projects will be disclosed as minimum 30 days before expected date of GCF approval pursuant to the requirements of the GCF Information Disclosure Policy. State-level subprojects will disclose all relevant documentation as minimum 30 days before expected date of BNDES approval.

Disclosed documents must be presented in a way that is accessible and culturally appropriate, placing due attention to the specific needs of community groups which may be affected by project implementation (such as literacy, gender, differences in language or accessibility of technical information or connectivity).

IFAD and the project will ensure the widest dissemination and disclosure of project information possible. Taking into account special needs and limited access to web content; in this regard, special attention will be placed on potential project participants: farmers, illiterate or technological illiterate people, people with hearing or visual disabilities, people with limited or no access to internet and other groups with special needs. The dissemination of information among these groups will be carried out by BNDES and the State partners. All accessible and locally available tools for disclosure will be utilized, including social media, local newspapers, flyers, brochures, radio, and television. Special attention will be placed on dissemination of project environmental and social safeguards, including the Grievance Redress Mechanism.

14. GRIEVANCE AND REDRESS MECHANISM

IFAD's Grievance Redress Mechanism can be accessed when necessary to manage project-related grievances that cannot be resolved by the project's Executing Entity. IFAD's has a Complaints Procedure for alleged non-compliance with its social and environmental policies and mandatory aspects of its Social, Environmental and Climate Assessment Procedures (SECAP).

IFAD-funded projects and programmes are designed in a participatory manner, taking into account the concerns of all stakeholders. IFAD requires that projects are carried out in compliance with its policies, standards and safeguards. Moreover, IFAD's Strategic Framework calls for ensuring that projects and programmes promote the sustainable use of natural resources, build resilience to climate change and are based upon ownership by rural women and men themselves in order to achieve sustainability.

The objective of the IFAD Complaints Procedure is to ensure that appropriate mechanisms are in place to allow individuals and communities to contact IFAD directly and file a complaint if they believe they are or might be adversely affected by an IFAD-funded project or programme not complying with IFAD's Social and Environmental Policies and mandatory aspects of SECAP.

Complaints must concern environmental, social and climate issues only and should not be accusations of fraudulent or corrupt activities in relation to project implementation – these are dealt with by IFAD's Office of Audit and Oversight.

Principles of engagement

The channels of engagement adhere to the process of communication with the different stakeholders, which rely on:

- Quality of service: handling the requests and complaints from respondents with proper quality of service.
- Free and Impartial service: respect for the diversity of different publics, with the commitment to exercise activities impartially, without favour of any order, free of prejudice and any fraud, corruption or practice of actions harmful to national and international public administrations.
- Right to Information: guaranteed right to access information, in transparent, clear and accessible language, in accordance with the law.
- Channel of dialogue: maintain an open channel of dialogue with the news media, social networks, and various other social sectors.
- Good faith and willingness to resolve the conflict, grievance, complaint or dispute should be considered as an essential pre-requisite to the process;
- A mediator may be mutually agreed to assist with resolving the conflict and/or grievance;
- The decision/resolution arrived through mutual agreement should be considered as final;
- Such decision would be signed by both parties and witnessed and communicated as the final and binding decision – at whichever level a decision or resolution of conflict or grievance is agreed.

Eligibility criteria

To file a complaint for alleged non-compliance with IFAD's social and environmental policies and mandatory aspects of its SECAP, IFAD will consider only complaints meeting the following criteria:

- The complainants claim that IFAD has failed to apply its social and environmental policies and/or the mandatory provisions set out in SECAP.
- The complainants claim that they have been or will be adversely affected by IFAD's failure to apply these policies.
- Complaints must be put forward by at least two people who are both nationals of the country concerned and/or living in the project area. Complaints from foreign locations or anonymous complaints will not be taken into account.
- Complaints must concern projects/programmes currently under design or implementation. Complaints concerning closed projects, or those that are more than 95 per cent disbursed, will not be considered.

The process

The complainants should first bring the matter to the attention of the State-level Implementing Unit responsible for implementing the project at state level, or to any governmental body with the responsibility for overseeing the Lead Agency. Each SIU will designate a person responsible for follow-up of complaints and resolution and make case-by-case referrals to local / regional teams to meet each specific demand.

If the SIU does not adequately respond, then the matter may be brought to the attention of IFAD. The issue may be brought straight to IFAD if the complainants feel they might be subject to retaliation if they went to the SIU directly.

The Regional Division will examine the complaint and, if necessary, will contact the SIU, or the governmental body with the responsibility for overseeing the SIU, to decide if the complaints are justified.

If the complainants request that their identities be protected, IFAD will not disclose this information to the SIU or anyone else in government.

If the complaint is not justified, the Regional Division will inform the complainants in writing.

If the Regional Division finds the complaint is justified and there is proof of actual or likely harm through IFAD's failure to follow its policies and procedures, IFAD will take action. This may consist of making changes to the project/programme, or requiring that the EE observes its obligations under the Financing Agreement. IFAD's response will focus bringing the project/programme into compliance and no monetary damages will be available or paid in response to such complaints. The complainants will be informed of the outcome of the issue by the Regional Division.

In all cases, if the complainants disagree with IFAD's response, they may submit a request to SECAPcomplaints@ifad.org and request that an impartial review be carried out by the Office of the Vice-President.

The Office of the Vice-President will decide on the steps to be taken to examine such complaints, including, if necessary, contracting external experts to review the matter. The complainants will be informed of the results of the review.

IFAD will include in its Annual Report a list of received complaints and a summary of actions taken to address them.

How to submit a complaint

A complaint relating to non-compliance with IFAD's Social and Environmental Policies and mandatory aspects of its SECAP can be submitted in any of the following ways:

- Download the complaints form (Word).
- Send an email to SECAPcomplaints@ifad.org or mail to:

IFAD
SECAP Complaints (PMD)
Via Paolo di Dono 44
00142 Rome, Italy

Complaints must include the following information:

- Name, address, telephone number and other contact information
- Whether the complainants wish to keep their identity confidential, and if so, why
- Name, location, and nature of the IFAD project/programme (if known)
- How the Complainants believe they have been, or are likely to be, adversely affected by the IFAD-supported project or programme

The project-level Grievance Redress Mechanism (GRM)

The project will establish one or more grievance mechanisms at field level to file complaints. Contact information and information on the process to file a complaint will be disclosed in all meetings, workshops and other related events throughout the life of the project. The project will include in the capacity building program information on the GRM and will organize consultations to determine the most suitable way for beneficiaries and stakeholders to communicate their concerns and ideas.

The GRM and guidelines will be developed for the project taking into account IFADs corporate Complaints Procedure to receive and facilitate resolution of concerns and complaints with respect to alleged non-compliance of its environmental and social policies and the mandatory aspects of its Social, Environmental and Climate Assessment Procedures.

The project will also be responsible for documenting and reporting as part of the safeguards performance monitoring on any grievances received and how they were addressed.

How to submit a complaint at project level

Complaints can be raised either orally or in writing, directly to the SIU or CPMU, which will be responsible for creating and notifying of a digital and physical address to which complaints can be addressed.

Complaints must include the following information:

- Name, address, telephone number and other contact information
- Whether the complainants wish to keep their identity confidential, and if so, why
 - All necessary provisions will be taken to keep complainants' identities confidential in the complaints procedure when so requested.
- Name, location, and nature of the IFAD project/programme (if known)
- How the Complainants believe they have been, or are likely to be, adversely affected by the IFAD-supported project or programme

The process at local level

Submitted complaints will be sent to the Project Manager and M&E officer to assess whether the complaint is eligible. Project Manager will inform and incorporate the relevant Senior Safeguards specialist, social and/or environmental, as required.

Eligible complaints will be addressed by the SIU. The PM and relevant Senior Safeguards Specialist, with support from the M&E Officer will be responsible for recording the grievance and how it has been addressed if a resolution was agreed.

If the situation is too complex, or the complainer does not accept the resolution, the complaint must be sent to a higher level, until a solution or acceptance is reached:

- 1st level: At this level, received complaints will be registered, investigated and solved by the SIU.
- 2nd level: If the complaint has not been solved and could not be solved in level 1, the SIU must report it to the CPMU. Received complaints will be registered, investigated and solved by the CPMU.
- 3rd level: If the complaint has not been solved and could not be solved in level 2, the complaint must be submitted to IFAD following the procedure stipulated above.

Notwithstanding the above, all complaints may be directly submitted to BNDES (2nd level) where applicable stipulations in the Brazilian norms and in the BNDES ombudsman's office will prevail. The GCF

independent Redress Mechanism and the Secretariat's indigenous peoples focal point will be available for assistance at any stage, including before a claim has been made.²⁰

For every complaint received, a written proof will be sent within ten (10) working days; afterwards, a resolution proposal will be made within thirty (30) working days.

The SIU will monitor the progress of responses to the claimants through resolution of the demand.

The SIU will include in its progress reports a summary of the responses to grievances and complaints during the corresponding period. The reports should contain the complaints presented, the procedures used for handling the complaints, the targets of each project's actions, within the framework of the steps described below:

Step	Procedures
1. Receive the demand	Demands may be received through different communication channels and should be directed to the respective SIU.
2. Analyse the demand	The recipient of the demand should analyse its content, verify if there is a need for referral to specific areas of the project or to the executing entity (for example, technicians responsible for a specific component or local teams). The recipient should also determine whether the demand can be solved without the need for referral, that is, in the cases of a simple doubt that can be clarified and resolved by the recipient.
3. Referral	After the analysis, depending on the subject, any demand with sufficient specific data should be sent to the SIU, which will forward it to the area responsible for its resolution. It is important that feedback be given to the claimant with information about the referral.
4. Follow-up	The SIU should monitor the processing of the specific demand (those with a greater degree of severity) to streamline and intermediate the actions and also evaluate the response from the area responsible areas and, if unsatisfactory, seek to mediate and find new path of resolution.
5. Response to claimant/complainant	The plaintiff/claimant should be informed about the processing of his claim. This response shall not exceed 15 days, except in cases of out-of-court or judicial litigation that depend on case-by-case time limits.
6. Resolution	Complaints can only be closed by the response to the complainant and, in the case of grievances; the answer must contain the resolution adopted.

In compliance with the resolution, the person in charge of dealing with the complaint, may interact with the complainant, or may call for interviews and meetings, to better understand the reasons.

All complaint received, its response and resolutions, must be duly registered.

Upon acceptance a solution by the complainer, a document with the agreement should be signed with the agreement.

²⁰ Information available at: <https://irm.greenclimate.fund/home>

Resolution

Upon acceptance of a solution by the complainer, a document with the agreement should be signed.

Other Considerations

Certain measures will most definitely favor the efficiency of the Grievance Redress Process within the context of PCRP. The first of these measures is the creation of mechanisms and procedures that promote Stakeholder groups' engagement in the Project's strategic actions, such as the implementation of management bodies that incorporate multiple stakeholders at both the CPMU and State-level Implementing Units (SIUs) levels. At the SIU level, consultative councils will be created to ensure that PCRP's objectives and strategies are met, with a deep commitment to principles of transparency and equity, through the full participation of the beneficiaries, state secretaries and representatives from civil society partner organizations. In order to guarantee that the most vulnerable stakeholder groups will be well represented in these representative spaces and bodies, rigorous selection criteria will be strictly followed. Their active participation will also be stimulated through the following measures: (i) Inputs of stakeholders will be considered in the construction of Baseline studies during the first year of the Project's implementation cycle; (ii) A crosscutting approach to gender, race and ethnic aspects will be incorporated in Territorial Resilience Investment Plans, as well as in other strategies and methodological instruments, with the guidance and orientation of Youth, Gender and Traditional Communities Specialists; (iii) Consultations with traditional communities will take place so as to guarantee free, prior, and informed consent; and (iii) periodic evaluations will be prioritized, based on a review of potential social and environmental risks and strategy-planning for overcoming such obstacles.

All Professionals that act on local and regional levels within the scope of PCRP must be aware of the principles contained in the SECAP and IPPF – Indigenous Peoples Planning Framework and how they influence their intervention strategies. For instance, all technical assistance professionals that act directly in the field should be aware of project ESMP and specifically that a consultation process should be undertaken to solicit and obtain indigenous peoples' free, prior and informed consent (FPIC) before any action is taken in indigenous peoples' communities and /or if there exists the possibility that proposed interventions might directly affect indigenous peoples' communities and their rights. The principles of this IPPF, which is line with the Green Climate Fund's Indigenous People Policy and the IFAD Policy of Engagement with Indigenous People, should be clearly laid out in Training sessions in the first 6 months of PCR's implementation cycle. Measures such as these represent forms of assuring good performance standards within the Project, in such a way that complaints and grievances, although they are inherent to any social process, are dealt with in due time and do not necessarily need to be taken forward within formal mechanisms and procedures.

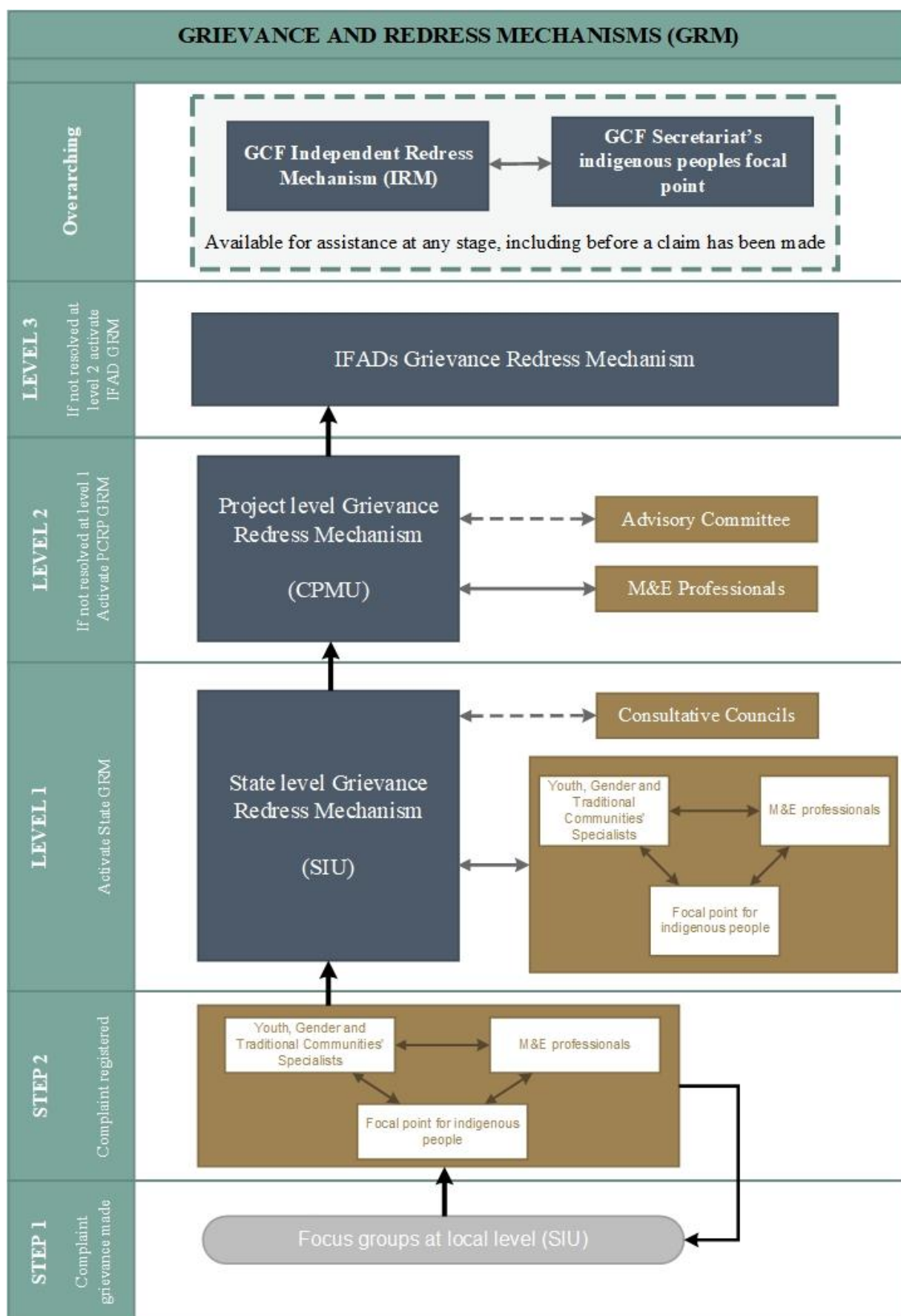
In evaluation and monitoring sessions, that will take place every 6 months, focus groups will be formed so as to facilitate the expression of opinions by specific segments (ex: women x men; youth x elders) about different aspects of the Project's implementation process (activities planned, environmental and social risks, etc.) The evaluation and monitoring of Project strategies and actions should take place on an ongoing basis, as risks and impacts arise, and should be free from any sort of interference, coercion or intimidation on the part of Project team members or other third parties. Creating designated spaces for evaluation processes that allows for the voices of disadvantaged groups to be heard is a necessary

measure for safeguarding their possible concerns, in such a way that they do not necessarily become formal complaints and grievances. In the case of rural women, for instance, who tend to suffer from situations of violence or other forms of violations in the family units or in community instances, such focus groups are an efficient strategy for creating a safe space in which such issues can be raised and dealt with in a proper manner. Gender specialists, who act on all levels of the Project, will also be important mediators of such complex situations, guaranteeing at all times the upmost confidentiality and protection of possible victims.

It is important to clarify that accessing a grievance mechanism should represent the last resort, given that constant dialogue between these most vulnerable social groups and Professionals trained to consider such demands and mediate conflicts, such as the Youth, Gender and traditional communities Specialists, will be cultivated through the Stakeholder Engagement strategy (see Annex 7 for greater details). This strategy can be seen to be an act of prevention – so that concerns can be channeled and expressed in due time and don't necessarily need to move on to the next level, becoming full-fledged grievances.

Once an identified problem turns into a formal grievance and is taken to the Project-level mechanism, it is important that vulnerable stakeholders understand that their legal rights will be protected under a national judicial process. Also, it should be made clear to them that, if they are not satisfied with the resolution that has been provided by the Project-level local mechanisms, another option involving mediation through conflict resolution exists. This possibility should be widely disseminated in all explanations given about the GRM and its forms and stages of operation during the process of fortifying Stakeholders and their engagement in the Project as a whole, as well as once any complaints are registered. In the case of indigenous people, this option may be considered to be more culturally appropriate, given their different conceptions of adequate processes for mediating conflicts and finding collective solutions within the context of PCRPs' interventions. The mediator to be chosen in such cases should be a person who has credibility in the context of indigenous communities and who displays understanding of their cultural specificities. Strict criteria concerning the profile and experience of this professional should be reviewed and validated by Management Councils at the PMU level, as well as other governing instances.

Figure 4. Grievance Mechanisms and process



APPENDIX 01 – FINANCIAL ADMINISTRATION AND ACCOUNTING PROCEDURES

Financial administration and accounting procedures

PCRP / GCF-FIDA-BNDES

I. Introduction

BNDES has proven capacity in financial management (FM) systems to provide internal controls so that project resources are appropriately used for intended purposes, with due regard to the principles of economy, efficiency, effectiveness, and transparency. The main challenges for FM are: (a) the project's innovative design with sub-executors and multiple financial instruments, which could cause risk of delays in implementation; (b) BNDES action through its organizational structure as management supervisor of the sub-borrowers. Although BNDES has already implemented projects financed by international organizations with similar operations (including World Bank and Inter-American Development Bank), additional internal training will be necessary to reduce the risk of delays in implementation of processes and disbursements, particularly during initial project implementation.

II. Financial management arrangements

1. Project management: The Central Project Management Unit (CPMU) will be set up in BNDES' productive inclusion management department, which will carry out the project's technical and financial coordination with the postulating states that will act as project co-executor. Each co-executor will set up a SIU with the required staffing structure that will be responsible for resource management and preparation of technical, physical and financial reports to the CPMU, which will in turn submit the reports to the Consultative Council (MC) and IFAD, which will report to the GCF. The SIU may select a nongovernmental organization that will support implementation of knowledge management and South-South cooperation. Part of GCF grant funding will be allocated to implementation of Component 3 activities. As part of the CPMU, BNDES financial sector will act with overall fiduciary responsibility to execute the financial arrangements established in IFAD manuals (disbursement, reporting and audit manuals) in order to ensure satisfactory financial management and implementation.
2. State financial management: In each state-level SIU, a financial management sub-unit will be established with capacity and experience in executing projects of this nature, which will report to the SIU coordinator in order to meet the demand for administrative, budgetary and financial execution and to carry out the procedures necessary for project implementation. It will be responsible for interacting with the CPMU / BNDES and IFAD, managing financial reports and monitoring implementation of the AWPB. Budget and financial execution will be conducted by the state using its installed capacity. The SIUs will receive support from the SIU's exclusive financial management unit (including a financial manager, technical professional in financial management, and budget / planning specialist able to operate under IFAD standards). This SIU unit will be responsible for direct management. Responsibilities include: i) request budget for activities to be performed; ii) record financial information; iii) request financial expenses from state and BNDES; and v) conduct effective management of rural producers organizations (RPOs) agreements and their respective accountability. The financial management (FM) should establish a management and accountability agreement to

support the RPOs in management of their agreements, and in particular in proper application of resources and accountability.

3. Implementation steps: For project implementation, BNDES will work in partnership with state governments that will execute projects in their geographical area. Submission of projects must follow BNDES rules applying at that moment as per item 5 of PIM.
4. Governance: The project will set up an advisory committee, in addition to the internal BNDES units. BNDES will maintain continuous communications with these units and committee for appropriate implementation of the project results through the established governance structure informed by item 3 of PIM.
5. Geographical scope: The target area is the Semiarid Region of Brazil's Northeast, which is home to the population with the highest indices of extreme rural poverty and rural poverty in the country. The area presents a high potential for development of specific productive activities. Project actions will be carried out by state governments through their SIUs to assist rural producers organizations and lower the risks involved in implementation and strengthen controls.

III. Project financial profile

6. Eligible disbursement categories: The table below presents the Eligible Disbursement Categories to be financed by the IFAD/GCF Loan and grant, the allocation of IFAD amounts to each category, and the percentages of expenditures for each Category item:

Table 1. Allocation of IFAD funding by disbursement category

Expenditure category	IFAD		GCF loan		GCF Grant		Government /BNDES		Beneficiaries		Total	
	Amount		Amount		Amount		Amount		Amount		Amount	
	U\$S MM	%	U\$S MM	%	U\$S MM	%	Cash/ In kind	%	In-kind	%	U\$S MM	%
Goods, Services, Works, and Grants	30,000	14.7	65,000	31.8	34,500	17	59,282	29	15,333	7.5	204,115	93.7
Management and Administrative Provision	-	-	-	-	-	-	13,718	100	-	-	13,718	6.3
Total	30,000	13.7	65,000	29.8	34,500	16	73,000	33.5	15,333	7	217,833	100

7. Disbursement categories are:

Goods, Services, Works and Grants, include:

- Consulting, technical assistance, seminars and trainings: Consulting expenses, technical and administrative studies, updates of management information system (MIS) for use in project monitoring and baseline studies and evaluations including audits and technical assistance to beneficiaries, rural schools and rural producer organizations; seminars, and training, which will include reasonable expenses incurred by the project to cover transportation and per diems for instructors and participants, lodging, meals, space and equipment rental, as well as materials to be used in the project;
- Fund for productive development plans: Subsidies to climate resilient investment plans with productive investments: direct investments or by contracting service providers or transferring

resources to rural producer organizations for access to water through implementation of productive investment plans; for other social technologies and black / gray water reuse systems, bio-saline farming system, procurement of goods and contracting of works and services;

- Civil works, goods, services, and inputs: Equipment and goods procured for project implementation will include, among other things, computer hardware, audiovisual equipment, and office equipment; Regular non-consulting services contracted by SIUs; and, Minor civil works and remodeling of physical installations carried out by SIUs, including regional offices; and for water resources.

Management and administrative provision, include:

- Management and administrative provision: Administrative costs related to SIUs and regional offices with temporary staff, wages and social security payments; and, Operating costs including incremental operating expenses of reasonable value related to monitoring and supervision, supplies, maintenance, printing services, communication costs, travel costs, including air travel, lodging, ground transportation, and per diem allowances, office rental, monthly utilities, office maintenance; rental of vehicles as well as logistics services.
8. Retroactive financing: not allowed according to GCF rules.
 9. BNDES and state counterpart contributions: BNDES will make available counterpart financial funds as a financing line in the form of a sub-loan to States to finance the Project's investment activities. States may choose to take these loans from BNDES or make their own financial funds available. For the management expenses of SIUs, States may provide economically measurable consideration (in kind) to be recorded and presented together with their accountability.
 10. Beneficiaries' counterpart contributions: These will be itemized in Disbursement Category 2 - Productive Investment Fund / SAF and may be economically measurable (in-kind) registered and presented together with their accountability to SIUs and should observe the IFAD's Technical Note on In-kind Contributions.
 11. Disbursement preconditions: Some preliminary steps will be necessary before the project can request a disbursement (withdrawal application): i) opening of a designated account in US dollars; ii) appointment / selection of CPMU financial team; and (iii) IFAD-approved and updated financial management manual.

IV. Implementation organizations and their fiduciary responsibilities

12. **Main project agency (Executing Entity - EE)**: The BNDES as EE will have overall responsibility for project implementation. BNDES has accumulated experiences in the area of the project, namely: i) issues related to development of family agriculture, especially access to water in the semi-arid region of Northeast Brazil; ii) fundraising with multilateral organizations; iii) financing state government development projects; and iv) partnerships with NGOs on project-related issues.
13. Other organizations involved - implementing states: State governments, legal bodies under domestic public law, will be underwritten by the project, whose implementation will be carried out by the state secretariat responsible for family agriculture policies and the Secretariat of Finance (SEFAZ) will control the availability of resources related to the counterpart and the payment of financial charges arising from the financing. For the budget action, the Planning Secretariat will act in the preparation of the government proposal for each year of the project. In addition, the state Comptroller's Office will work on internal controls and audit.

V. Financial management and organizational aspects

1. Organization and personnel: BNDES financial team is composed of qualified staff who have the training, experience and knowledge required for proper execution of management procedures and policies. The SIU will carry out the administrative and financial coordination in association with the existing BNDES administrative and financial structure. The training plan should include the strengthening of BNDES for appropriation of IFAD's current standards. For implementation by states, financial managers should be designated in the SIU so that they are fully aware of the modus operandi of the state project as part of the general project.

2. Budget process: During execution of the state projects, the CPMU will be responsible for ensuring sufficient resources in the investment budget with BNDES and the counterpart funding through the state budget cycle, which includes planning of all project activities, which should reflect the PPA, LDO and LOA. The state project budgets will take place within the scope of the BNDES, which will consolidate them in the project's general AWPB. Use and appropriation of budgets will follow the normal routines of expenditure execution (commitment of budget, settlement of expenditure, and payments to creditors), segregated in terms of IFAD's funding sources and the counterpart that cannot be contingent. These procedures will be carried out by the BNDES financial unit instructed by the CPMU and in the state SIUs.

3. Disbursement arrangements and flow of funds: IFAD will be the fiduciary agent for the GCF loan and grant funds and will operate under the IFAD general conditions for agricultural development financing and its disbursement, financial reporting and audit manuals available on its website and additionally under BNDES regulations.

GCF funds managed by IFAD and its funds will be deposited in a designated account (in USD), opened and maintained by BNDES exclusively for financing this project. There will be an operating account in Brazil opened and maintained by BNDES for processing on-lending to state operating accounts and for paying project activities directly executed by BNDES.

According to BNDES rules and procedures, the CPMU will send requests to the BNDES finance department (FD/BNDES) for transfer of IFAD funds from the designated account to the operating subproject account(s). BNDES counterpart funds will also be deposited in the subproject operating account(s). Implementation of the financial resources will be in accordance with the approved AWPB.

There will be an initial advanced payment from IFAD/GCF loan/grant accounts to the account designated at the BNDES. Subsequent disbursements will be based on submission of disbursement requests accompanied by declarations of expenditure for at least 30% of the amount advanced.

Further details and disbursement procedures will be included in the Letter to the Borrower (LTB), to be prepared by IFAD and sent to the Borrower once the Financing Agreement enters into effect. The procedures and disbursement requirements associated with the GCF will also be addressed in the LTB. The project is expected to benefit from use of the IFAD Customer Portal (ICP) platform for BNDES to submit electronic disbursement requests to IFAD and contract follow-up. For subprojects, BNDES will act similarly in partial disbursement of funds and successive releases through presentation of statements of expenditures in accordance with its institutional financing procedures and the financial

procedures manual to be approved by the project.

Disbursement flow

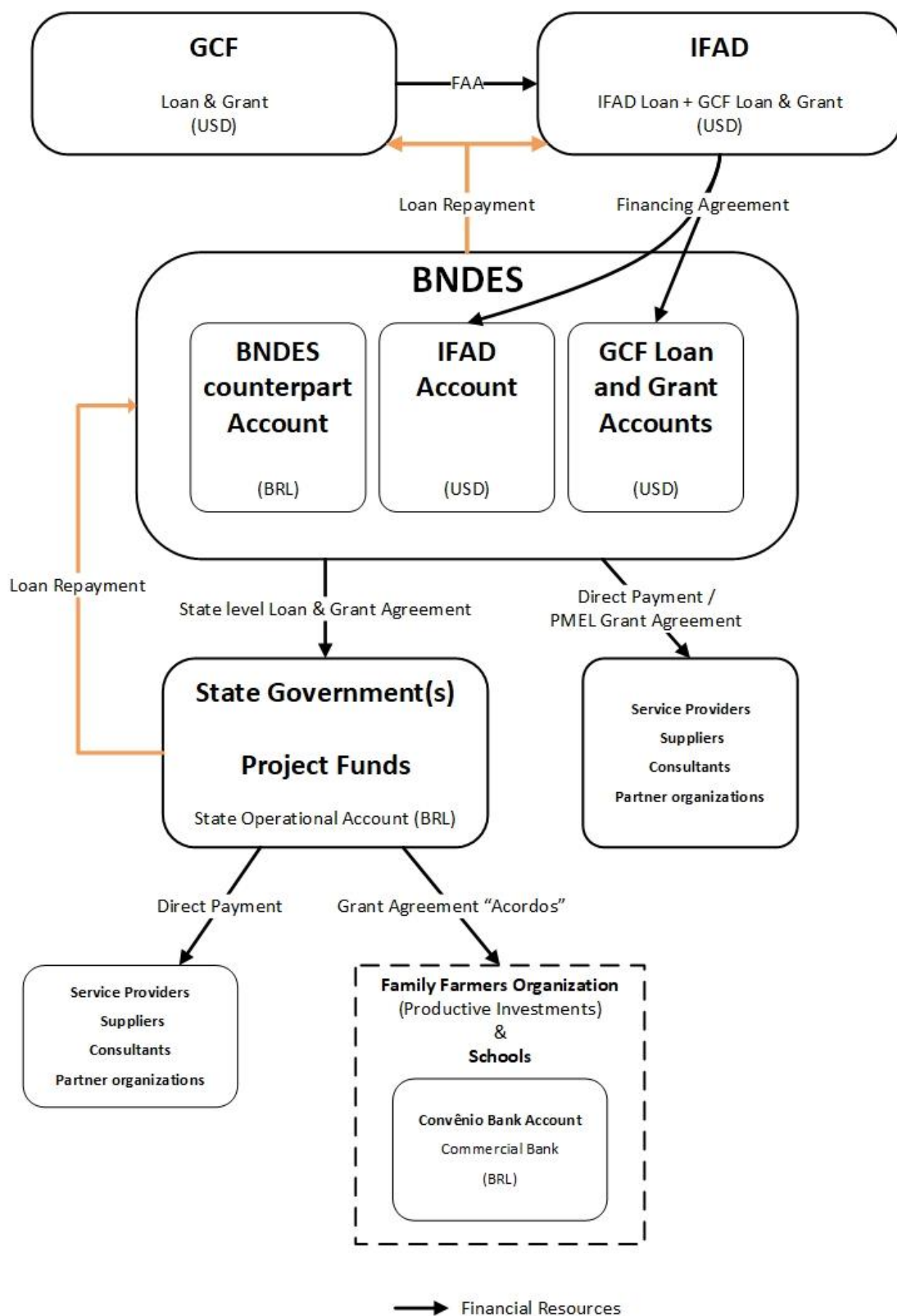
Funds will be disbursed in the currency specified in the financing agreement transacted through at least three accounts, as described below:

- GCF loan and donor accounts in the currencies defined in the contract, opened and handled by IFAD in accordance with requests for disbursements sent by the CPMU. Withdrawals will be linked to Financial Agreement 2000002253;
- Designated accounts linked to Financial Agreement 2000002253, opened and maintained by the Borrower, in its name, for receiving IFAD deposits (disbursements or repayments) directly debited from the loan account and from revenues, which become the Borrower's resources in the currencies of respective contracts;
- Operating account in Reais (R\$), managed by the Borrower, for depositing the closing credits of the foreign exchange contracts of the designated accounts;
- State operating accounts in Reais (R\$), managed by the state governments (via the Treasury Department) opened in a commercial bank to receive deposits of the BNDES funds linked to the project and possibly the state counterparts.

From the operating accounts, the CPMU will make transfers to the state operating accounts, which in turn will make payments to consultants, suppliers of goods and services, transfers to producer organizations or other entities, according to the project's AWPB. These procedures will be recorded and processed in the MIS, from the BNDES on its on-lending and in the states, as well as its expenses, appropriately disaggregated by categories of expenses, project components, and financing sources. Expenditures must be applied to the project's objectives duly justified and supported in a timely manner in a specific form, through expenditure declarations.

The CPMU shall justify the on-lending to IFAD. These transfers should be tracked by the CPMU and the monitoring and reporting arrangements will be detailed in this manual. The project arrangement still provides for BNDES to hire an entity (or entities) for execution of activities in Component 3.

The conditions and instructions for repaying the financing of the IFAD and GCF loan funds are expressed in the Financing Agreement.



Disbursement methods

As stipulated in the Letter to the Borrower, the project can use four methods of disbursement: 1) withdrawal of funds by advance; 2) direct payment; 3) special commitment; and 4) refund.

1. Withdrawal of funds by advance / replenishment of designated account: This method is used to advance and/or replenish funds in a bank account indicated by the borrower. IFAD can set the maximum amount it can advance. The specific conditions of this type of disbursement are agreed upon by the Borrower and the Fund, and are detailed in the LTB.

2. Direct payment: This method is used for eligible project costs that are paid directly by IFAD, usually in large contracts, suppliers, contractors, consultants or third parties, with the Borrower's authorization.

3. Special commitment: This method is used for project-allowable expenses related to items imported by project-implementing agencies by virtue of a letter of credit requiring repayment guarantees from IFAD's negotiating banks.

4. Refund: Applied when the eligible project costs have been pre-funded by the Borrower. This refund must be requested within 90 days from payment date by the Borrower and will be received in the currency of the expense.

Forms, instructions, information and explanatory notes for preparing and handling disbursements²¹

The project may request disbursements through advance / replenishment of the designated account with presentation of the statement of expenses (SOE). In this case, the initial allocation to the designated account shall be in advance and shall reach the ceiling set in the LTB. The other disbursements will occur through an advance/replenishment always respecting the ceiling limit and minimum of 30% of this amount.

Supporting documentation required for the advance / replenishment method includes:

- Summary Sheet-SS (Form 101) with supporting documentation itemizing eligible expenses (copies of invoices, receipts and/or vendor invoices and contracts) for contract payments over USD 100,000, if any;
- Statement of Expenses - SOE (Form 102/A) for all other expenses/contracts for expenses below USD 100,000. Submission of supporting documentation is waived, and it should remain in SIU files for audits and surveys;
- Summary by categories of expenditure (Form 103);
- Request for withdrawal checklist (Form 105);

²¹

These procedures are presented in section 3 and Annexes 2 and 3 of the IFAD Disbursement Handbook.

- Record of Contracts (Form C-10) for contracts subject to prior review in effect in the period;
- Contract Payment Tracking Sheets (Form C-11) for each contract, updated for contracts subject to prior review whose payments occurred in the period, accompanied by a copy of non-objection;
- Reconciliation of the Designated Account (Form 104 / A);
- Copies of bank statements of the designated and operating accounts for the corresponding period.

The steps for effecting a disbursement using the advance / reset procedure are:

- The CPMU requests IFAD to make the initial deposit, through the Request for Withdrawal, in accordance with the instructions contained in the Letter to the Borrower;
- IFAD makes initial deposit in the designated account;
- The CPMU requests internalization of resources in the operating account;
- Based on the financial sub-contract signed with sub-contractors, BNDES makes the necessary payments;
- For replenishment, the CPMU prepares the accounts through the Statement of Expenses (SOEs) and/or summary sheets (SS), supporting documents, summary by expense categories, reconciliation of the designated account and statement of the designated account, and requests IFAD to recompose the designated account to the ceiling established; and
- After review, IFAD recomposes the designated account. SOE/SS will be prepared in the BNDES financial management system. Until the financial system is adequate to the SOE / SS, electronic spreadsheets will be prepared with data extracted from the existing system, for a maximum period of six months. BNDES financial unit will be responsible for the commitment and payments; the SIU will be responsible for registering in the systems, monitoring and providing management information.

Exchange rates

To reimburse the amount actually withdrawn from the designated account(s), local currency expenditures (Brazilian Reals - BRL) financed from IFAD resources (made directly through these accounts or through the project) will be converted using the exchange rate applied by the Bank when it transferred the funds from the designated account(s) to the project's operating account in local currency.

To avoid discrepancies, on the date of transfer, the project must closely monitor the exchange rate of the currency in which the disbursement from the designated account to the project's operational account (local currency) is requested. The amount of the withdrawal request submitted to replenish the Designated Account should be consistent with the sum of the amounts withdrawn and transferred to the project's local currency account.

The amounts withdrawn from the project's operating account to finance 100% expenses with funds from BNDES (counterpart) should be converted by the Brazilian Central Bank (BCB) exchange rate - USD Ptax / USD - <http://www4.bcb.gov.br/pec/taxas/port/ptaxnpsq.asp?id=txcotacao>; or (i) on the last day of the month in which such expenses are incurred; or the rate on the day of expenditure - (DEFINE

AND ADOPT A PROCEDURE FOR THE LIFE OF THE PROJECT)

Internal control: Internal control will be ensured by specific assignment of duties, reconciliation of accounts, and expenses approved by experts. Process flows should be clear and well understood by CPMU and SIU personnel. All budget and accounting transactions in the project will be conducted through the accounting management system (AMS) of each entity. All payments will follow each step of the the commitment, settlement and payment routine. All project costs are accounted for in accordance with each entity's annual work plan and budget (AWPB) and linked to one of the project's specific accounts, allowing comparison and reconciliation with project records compiled in the AMS. To strengthen internal control, the CPMU will provide details of the conditions, responsibilities and procedures in a financial procedures manual. For execution of expenses of the resources transferred by contract to state and NGO co-executors, a project financial procedures manual will describe the processes to be carried out. The manual will contain detailed procedures and guidelines for disbursements, approvals, commitments, payments, and reports.

Accounting systems, policies and procedures: BNDES uses its financial management system for planning, execution, and monitoring of projects and activities. The system will provide information for monitoring the Annual Work Plan and Budget (AWPB), use of resources, project accounts, counterpart contributions, contracts and agreements by category of expenditures or project component, and sources in Brazilian Reais (BRL) and US dollars (USD). The system will also generate timely financial statements, financial reports, statements of expenses and other forms of accountability to IFAD, as well as monitor the AWPB. It must be reconciled monthly with the designated account (USD) and operating account (BRL) and should capture all counterpart contributions from other government sources and beneficiaries. The project may use the IFAD Client Portal to submit withdrawal and accounting requests and IFAD can monitor project financial information.

State governments follow the Brazilian Accounting Standards Applied to the Public Sector (NBCASP), Law No. 4,320 / 64, which, according to the latest Country Financial Accountability Assessment (CFAA) conducted by the World Bank for Brazil, indicated that the law complies with international accounting standards since they provide for certain high-level accounting principles; and also follows the Manual of Accounting Applicable to the Public Sector (MCASP), published under the terms of Law 10,180 of 6 February 2001 and Decree 3,589 of 6 September 2001.

Using the system, each SIU will keep exclusive financial accounting and management records of the Project, which shall contain all records and related expenses by expense categories, in chronological order.

Financial reports: Both the CPMU and SIUs will generate financial information, identifying funding sources and expenses by budget item line, category, and component, following the national format. Existing systems must be adapted or an auxiliary accounting system developed in order to generate all necessary reports by category of disbursement and component in the annual and cumulative period of the project, in relation to AWPBs, including beneficiaries' counterpart contributions, and for the generation of IFAD-acceptable forms according to their disbursement and financial reporting manuals.

The CPMU will submit semi-annual interim financial reports (IFR) and annual financial statements to IFAD in accordance with IFAD's financial reporting and audit guidelines. The IFR's format and content should include: (i) sources and application of resources, by disbursement category, indicating IFAD's participation in expenditure financing as expenses accrued (from project start to date, from start of the year to the present and for the period) vs. budget costs, including analysis of variance; ii) use of resources by project activity or component, as accumulated expenses (from start of project to the present, from beginning of year to the present and for the period) vs. budget costs, including analysis of variance; and iii) reconciliation of the designated account, in the contract currency and in Brazilian Reais (BRL). SIUs will report to BNDES, supporting the CPMU in consolidation of information submitted to IFAD.

IFAD policy requires project monitoring to ensure that resources are used for the purposes indicated in the loan agreement and that due consideration is given to economy, efficiency, transparency and sustainability.

Financial monitoring will be conducted through the Interim Financial Reports (IFRs), which will complement the annual financial statements.

The CPMU / BNDES will present the semiannual IFRs (composed of the IFRs sent by each SIU in the course of project execution) no later than 45 days after the end of each semester. The IFRs will be prepared in the format provided by IFAD in accordance with the IFAD financial reporting and audit manual. The principles on which IFRs are based include:

- IFRs will provide useful information to the Borrower and at the same time provide sufficient information to enable IFAD to verify whether: (i) the disbursed funds are used for the intended purpose; (ii) implementation of the project is in progress; and (iii) expected costs will not be exceeded.
- Financial information should match information about the project's actual progress and procurement. Comparison of financial expenses with physical progress is essential to ensure satisfactory financial control of the project.
- Project oversight by CPMU / BNDES and IFAD should be effective, so IFRs should contain reliable financial information.

It shall be incumbent upon the CPMU and the SIUs to observe:

- Differences between expenses reported in the IFRs and those reported in the audit reports will be declared ineligible, with the amounts returned.
- Any change in the IFR model originally agreed upon should be discussed between the parties and approved by IFAD.

Internal and external auditing: The CPMU will request that the project be inserted into BNDES' internal audit routine. For the external audit, project accounts at BNDES and co-executors' accounts will be audited annually in accordance with the financial agreement in effect by independent auditors acceptable to IFAD in accordance with the TOR presented in Appendix 7 of the IFAD guidelines on project audits and may be financed with project resources. BNDES will promote this audit. The TOR will be reviewed by IFAD. The audit report should present a single opinion on the financial statements, statements of expenses and project accounts, and a management letter on the gaps in internal control. The report will be submitted to IFAD within six months after end of the fiscal year. The audit should be conducted in accordance with international auditing standards and INTOSAI. The Audit should include all State Projects and partner

entities that run IFAD funds.

VI. Preparation for project implementation:

- BNDES should provide professional personnel for financial management or contract additional consultants before the project enters into effect and during project execution maintain these trained personnel working in accordance with IFAD's FM, Audit and Anti-Corruption Guidelines and with the Project Operational Manual, in order to interact with SIUs under their respective funding to ensure that States have the capacity to manage the flow of resources and the funds use and accountability procedures, in line with the financial management guidelines.
- Supervision of the project's financial management provisions will be carried out annually by the CPMU and SIUs.

Table 4. Main actions to mitigate financial management risks

	Action to mitigate risk	Responsible	Timeline
1	Finalization of financial management section in project implementation manual	BNDES	Before entering into effect
2	Designate key personnel for CPMU financial management	CPMU	Before entering into effect
2	Conduct training on "An overview of IFAD's financial management practices and procedures" available at https://www.ifad.org/topic/resource/tags/financial_management/1957778	BNDES/CPMU States/SIU	Before entering into effect and then every two years
3	Support financial management with IFAD resources	ICO / Brazil IFAD financial management services unit	At start of project and each co-executor
4	Designate/hire staff for SIU financial management	SIU	Before funds are used
5	Assessment of CPMU's and SIUs' financial management performance through supervision	IFAD	From second year on

VII. Financial management supervision plan

Financial supervision of the project will be conducted directly by IFAD, without prejudice to other national control and oversight bodies, and will consist of evaluating execution of financial management and performance mechanisms, identifying corrective actions (when applicable), and monitoring fiduciary risks. Supervision will be conducted via semiannual financial and audit reports, and annual onsite visits, including: 1) evaluation of semiannual financial reports; (ii) evaluation of auditors' reports and follow-up of any questions raised by the auditors in their letter of recommendations; and 2) participation in on-site supervision of the Project (including visits to co-executors). There will be a Midterm Review of the Project evaluating: 1) progress regarding the achievement of Project results and the disbursement schedule; 2) effectiveness of institutional arrangements and financial management of project implementation; (iii) the financial procedures manual, with recommendations of indicated reviews and updates; (iv) the results of co-executors' financial management and implementation; (v) accomplishment of annual operational plans; and (vii) evaluation of the appropriateness of project expenditure categories. From the office, IFAD will conduct prior reviews of the initial bidding process of each planned method and those that exceed the resource margin set forth in the procurement plan and/or project project implementation manual. During supervisory, supporting and midterm review missions, IFAD will use sampling to analyze subsequent bidding processes. Annual audits will examine a sampling of bidding processes not verified by IFAD in its missions in order to more fully verify execution. All IFAD reviews and audits should adhere to IFAD's procurement guidelines, eligibility criteria and anti-fraud/corruption policies.

VIII. Project-related links and documents

IFAD website: www.ifad.org

IFAD Brazil website: www.fida.org.br

BNDES website: www.bndes.gov.br

Online course on IFAD's financial practices and procedures (available in Portuguese):
www.ifad.org/elearning_cfs_p/index.html

Loan disbursement handbook for IFAD-supervised projects (available in English and Spanish):

- English: www.fida.org.br/assets/downloads/Manual%20de%20Desembolso_Ingl%C3%AAs.pdf
- Spanish: www.fida.org.br/assets/downloads/Manual%20de%20Desembolso_Espanhol.pdf

Handbook for Financial Reporting and Auditing of IFAD-financed projects (available in English and Spanish):

- English: www.fida.org.br/assets/downloads/Manual%20Operacional_Ingl%C3%AAs.pdf
- Spanish: www.fida.org.br/assets/downloads/Manual%20Operacional_Espanhol.pdf

APPENDIX 02 – STATE PROJECTS FINANCIAL PROCEDURES MANUAL

SUMMARY

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INTRODUCTION

This document presents a set of rules and procedures on financial and accounting management for the PCR project with respect to national legislation and IFAD policies. States will use the country's systems to manage: record management, petty cash, processes of payments, travel arrangement and related expenditures and fixed asset management and other operational procedures.

FINANCIAL AND ACCOUNTING MANAGEMENT

Responsibilities for financial administration and implementation

The State Secretariat (SES) indicated by the SIU is responsible for financial administration and implementation; general and administrative coordination; budgetary, financial and accounting management; and general project accountability to BNDES.

For this purpose, it relies not only on SIU specialists (financial and technical specialists) but also on support from all administrative sectors of the State Secretariat, which will play an important role in the project's financial management functions. SIU technicians should be able to provide relevant and reliable financial information, in addition to supporting project coordination in the areas of control, planning, implementation and monitoring. In case of transfer of funds for other public executing entities, the attributions of the parties will be established in the terms of commitment signed with each co-executor. Such instruments shall define the technical, safeguard and fiduciary obligations, including procurement regulations and mentioning (where appropriate) payment for technical services provided to the project and its beneficiaries.

Administrative and financial management (AFM):

The team that will develop the administrative and financial management activities should include a manager and public finances technician.

The responsibilities of the Administrative and Financial Management include:

- Manage AWPB information on project costs and expenses;
- Manage project budget resources;
- Execute the project's financial and accounting operations;
- Prepare progress reports for analysis and decisions by SIU coordination;
- Monitor and execute payments and receipts;
- Support management of people who are linked to the project, ensuring their rights and promoting their development;
- Look after the assets acquired especially by the project and those assigned by SES;
- Supervise and participate in the expenditure settlement phase: receipt of services, equipment, products and works; inspection and release; measurement report; certification of services

provision; equipment, products and works; contract consultant(s), when necessary, to implement project actions;

- Prepare, review and track all agreements signed between the PCR-GCF project and the farmers organizations benefited by the project;
- Advise general coordination of project and take necessary steps on issues related to adequacy of the LDO and state legislation to assure feasibility of agreements and disbursements to beneficiaries.

Professional profiles

Position	Profile	Professional qualifications	Experience
Financial manager	<ul style="list-style-type: none"> • Ability to coordinate a team and work in coordination with the SIU and SES; • Knowledge about public finance management, accounting and mathematics; • Knowledge about financial management procedures for international loans 	<ul style="list-style-type: none"> • Degree in economics, administration, accounting sciences; • Skills in information technology (IT) 	At least 5 years experience in financial management and execution
Public finance technician	<ul style="list-style-type: none"> • Knowledge about financial execution, accounting, and mathematics; • Knowledge about financial management procedures for international loans 	<ul style="list-style-type: none"> • Degree in economics, administration OR accounting sciences; • Skills in information technology (IT) 	At least 3 years experience in the profession and at least 2 years managing financial and public accounting operations

SES responsibilities

SES holds the central responsibility for the project's administrative and financial functions, with authorization to pay suppliers and service providers and transfer resources to other public co-executing entities. Co-executors' responsibilities will be set in terms of commitment signed with each collaborator. Such instruments will define the technical and fiduciary obligations and safeguards, and when applicable the payment for technical services provided to the project and its beneficiaries.

Counterpart contribution

State counterpart contribution

The state government will be responsible for the co-financing defined in the contract signed with BNDES. The state government's counterpart deposits will be subject to the following conditions: 1) the Secretary of Planning will allocate sufficient counterpart funds to cover financial liabilities in the state's annual budget, with amounts sufficient for the required contribution; 2) amounts requested for deposit must be in accordance with the payout schedule established in the AWPB of the contract.

Beneficiary counterpart contribution

Beneficiary counterpart contributions may be financial or made in the form of goods / services. Measurable resources from the community or other sources will be considered financial counterparts. Non-financial counterparts should be monetarily measurable and effectively proven.

Individual and collective preexisting investments by members of the beneficiary productive groups can be accepted if the investment is project-related, as evidenced by documents of ownership of the real-estate and non-real-estate properties, such as fiscal invoices for procurement and technical certificates of goods and services, public deeds, credit agreements, lease, among other things. The community's contribution should be expressed in the investment plan and verified in project monitoring reports.

It is the SIU's responsibility to monitor and request financial contributions and documentation of such counterparts, as well as to ensure the correct documentation of actions carried out.

Accountability

Procedures for use of financial resources

Project resources used will be accounted for to BNDES/IFAD and state offices by the following steps: (a) accountability of resources paid to beneficiaries; (b) results of accountability analysis (approved or not) uploaded into financial system; (c) accountability between SES and other project-associated entities; (d) accountability of contracts and agreements; requests from state agency auditors will be met; (e) prepare financial statements; and (f) collect overdue or unapproved accounts.

The SIU will use BNDES' financial information system to enter accountability data and will prepare specific financial reports to be sent to BNDES semiannually or upon request.

Accountability between project and beneficiaries

Project beneficiaries will provide partial and final accounts of all resources received, including the counterpart contribution, when pertinent. All bidding, contracting, assessment, procurement and payment processes carried out by the beneficiary entities will be analyzed by the SIU.

Reports to BNDES

The SIU will draft and send the BNDES several documents/reports during project implementation, containing management information on the project as part of the requirements set in the loan agreement. Most of them have a preset submission schedule, as presented in the table below:

REPORTS TO BE SUBMITTED TO BNDES				
N o	DOCUMENT	PREPARED BY	PERIOD	DELIVERY DEADLINE
1	Annual Operating Plan	SIU	Annual	75 days before start of each year
2	Procurement Plan	SIU	Annual	75 days before start of each year (along with AWPB)
3	Interim Financial Reports (IFR)	SIU / Financial and administrative management (FAM)	Semiannual	By 30th day of month following start of semester
4	Financial statements	SIU/FAM	Annual	Within 60 days of beginning of the year
5	Progress report	SIU/MA	Semiannual	By the 30th day of the month following start of semester
6	Project completion report	SIU	-	On closing date of financing

ACCOUNTING PROCEDURES

Accounting records

The accounting records of execution of project-related operations shall be registered apart from other records that do not involve loan proceeds through the state's accounting system, which can present reliable results of financial operations in accordance with generally accepted accounting principles and Federal Law 4,320 of 17 March 1964 and the International Accounting Standards issued by the International Federation of Accountants (IFAC).

Project accounting will present financial information in financial statements, identifying funding sources and expenses by disbursement category and component on a yearly cumulative basis.

The project's accounts plan will follow the unique state standard used for all Direct Administration Bodies, containing the project expenditure categories (capacity development, capacity and productive development, project management, and monitoring & evaluation). Project accounting will be done through MIS. However, to be accountable to BNDES, the BNDES system will be used in subsidiarity.

SES is responsible for managing, classifying, filing and storing all documentation generated as a project product. For this purpose, it will designate an area duly outfitted to ensure conservation of all documents collected.

Budget

The budget and accounting of the Project and SES are part of the state's general system, so all transactions will be processed by the Accounting Systems of the States. Payments will follow the official commitment routines (commitment and payments/settlement). These functions will be performed by the SES's Administrative and Financial Management and/or the SIU.

Internal control

Internal control is executed by the state's General Comptroller. SES annual financial reports are made available for internal state audit purposes.

AUDITING

Project accounts will be audited annually by independent auditors to be contracted by BNDES in accordance with the IFAD-approved TOR. Based on the analysis, an audit report will be generated presenting a single opinion on the financial statements, expense statements and project accounts, and a management letter on any gaps in internal control. The report will be submitted to IFAD within six months after end of the fiscal year. The audit should be conducted in accordance with International Standards on Auditing (ISAs) and INTOSAI.

ANNUAL OPERATING PLAN

The Annual Operating Plan (AWPB) is a key planning tool. The AWPB contains the project's development objectives, targets to be met, and activity feasibility mechanisms.

In operational terms, the AWPB includes all activities planned for the year as well as the actions and inputs required in order to obtain results and products. It serves as a basis for monitoring the project's physical and budgetary execution in a particular year/period. It also contains the procurement and contracts that must be carried out, as well as the methods to be used.

The SIU will coordinate preparation of the AWPB and its administrative/financial management unit will be responsible for ensuring the necessary provisions between the AWPB, Plurennial Plan (PP), budgetary guidelines law (LDO in Portuguese) and annual budget law (LOA in Portuguese).

After the initial AWPB, the SIU will prepare and send subsequent AWPBs to BNDES for non-objection by **October 15** each year.

Documentation records

The SIU, through its administrative / financial management unit, will keep all documentation of all contracts, correspondence and procurement on file, including:

- ✓ All invoices and other payment documents (notes of commitment, settlement, payment, etc.);
- ✓ All documentation related to contract performance;
- ✓ All additional clauses added to the contract; and
- ✓ All documents related to claims under the contract, including guarantees.

APPENDIX 03 – TERMS OF REFERENCE FOR SIU TEAMS

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
Project Manager	<ul style="list-style-type: none"> - Direct the Project Management Unit technically, financially and administratively; - Coordinate and supervise the technical, bidding and contracting, monitoring and evaluation and administrative and financial areas for the execution of planned, on time and with quality; - Coordinate the preparation and execution of the Annual Operating Plan, the Procurement Plan, the budget and the annual reports; - Monitor, support and integrate the work of local managements and teams; - Articulate the Project with the other existing programs and projects; - Establish partnerships with public and private organizations of interest to the Project. 	<ul style="list-style-type: none"> - Ability to coordinate teams, leading them to work aiming to achieve the results of the Project; - Communication skills and institutional articulation; - Ability to negotiate and establish agreements of interest to the Project; - Knowledge of public policies on the theme Agroforestry and resilient rural production. 	<ul style="list-style-type: none"> - Higher education professional preferably in the areas of economics, agroecology, agronomy, public administration and sociology; - Desirable postgraduate studies in the area of work interest. 	<ul style="list-style-type: none"> - Experience of at least 10 years in management; - Relevant experience in managing development projects, preferably with external funding.

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
Project Manager Assistant	<ul style="list-style-type: none"> - Support the General Coordination in the technical, financial and administrative direction of the Project Management, Procurement, Monitoring and Evaluation and Administrative and Financial Unit for the execution of planned actions, on time and with quality; - Support the General Coordination regarding the preparation and execution of the Annual Operative Plan, the Procurement Plan, the budget and the mandatory annual reports; - Monitor, support and integrate the work of project managers, supervisors and other teams; - Supervise the progress of the execution versus the planned and attendance of the expected results. - Report information to the General Coordination; 	<ul style="list-style-type: none"> - Ability to coordinate teams, leading them to work aiming to achieve the results of the Project; - Communication skills and institutional articulation; - Ability to negotiate and establish agreements of interest to the Project; - Knowledge of public policies on the Project's theme. 	<ul style="list-style-type: none"> - Higher level professional preferably in the areas of economics, agronomy, agroecology, public administration, sociology; - Desirable Postgraduate in the area of interest of the work. 	<ul style="list-style-type: none"> Experience of at least 07 years in similar activities; - Relevant experience in managing development projects, preferably with external funding.

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
Procurement Specialist	<ul style="list-style-type: none"> - Guide the teams in the elaboration of the Terms of Reference and Estimation of Costs and Technical Specifications and Budgets; - Support the assembly of the Evaluation Evaluation Committee; - Guide the Evaluation Committee on the Technical and Financial Analysis of proposals / quotations, preparation of bidding reports, for the acquisition of goods, technical services and consultancy required by the Project; - Prepare the documentation for each acquisition process, as provided for in the legislation; - Follow up with the Bidding Centre the processes related to the Project; - Integrate the Commission and Analysis and Approval of Acquisition Plans and Annual Operating Plans within the scope of the SIU; - Manage contracts within the scope of the Project; - Prepare follow-up reports. 	<ul style="list-style-type: none"> - Knowledge of public legislation for the acquisition of goods and services; - Knowledge of the guidelines for the acquisition of goods and services from international organizations. 	<ul style="list-style-type: none"> - Higher education professional preferably in the areas of public administration, accounting, economics and law; - Ability to use information technology. 	<ul style="list-style-type: none"> - 7 years experience in public procurement; experience in donor-funded-projects is desirable; .
Accountant Specialist	<ul style="list-style-type: none"> - Support the project's financial and accounting activities; - Support field actions related to the documentation of beneficiary associations; - Support and guide the activities of procurement and rendering of accounts of beneficiaries; - Support beneficiaries' banking activities related to project resources; - Act in close relationship with the bidding professionals of the Project Management Unit. 	<ul style="list-style-type: none"> - Knowledge of the legislation of community associations; - Knowledge of public procurement of goods and services and respective accountability; - Knowledge of banking legislation; - Knowledge of accounting 	<ul style="list-style-type: none"> - Higher education professional in the area of accounting sciences; - Ability to use information technology. 	<ul style="list-style-type: none"> - Experience of 3 years in the exercise of the profession and at least 1 year in activities with community associations.

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
Technical Analysts	<ul style="list-style-type: none"> - Carry out the monitoring of field activities, related to the implementation of the respective components of the Project. - Provide guidance and technical support to local outsourced teams and associations of rural beneficiaries, in identifying potential economic activities and in preparing Resilient Productive Investment and Agroforestry Projects; - Prepare reports of execution of the actions of the Components and report to the Supervision. 	<ul style="list-style-type: none"> - Ability to work in a team; - Ability to communicate and negotiate with family farmers and their organizations; - Knowledge of public policies for rural development, markets and technologies adapted to the semiarid; - Knowledge in preparing proposals for rural productive investments. 	<ul style="list-style-type: none"> - Higher education professional, preferably in the areas of, agroecology, agronomy and related areas, with knowledge in agricultural and non-agricultural productive activities developed in the semiarid region of Brazil; - Ability to use information technology, including georeferencing. 	<ul style="list-style-type: none"> - 4 years experience in the profession. - Experience in developing family farming productive arrangements and in the formulation and execution of Rural Investment Projects.
Financial Management Specialist	<ul style="list-style-type: none"> - Monitor the POA information regarding the costs and expenses of the Project; - Perform financial and accounting operations; - Monitor and execute payments and receipts. - Guide the teams on the procedures for executing expenses; - Prepare monitoring reports for analysis and decisions by the UGP coordination. 	<ul style="list-style-type: none"> - Knowledge of management and execution of public finances, accounting and mathematics; - Knowledge of the financial management procedures for international loans. 	<ul style="list-style-type: none"> - Higher education professional preferably in economics, or administration or accounting sciences; - Ability to use information technology. 	<ul style="list-style-type: none"> - 5 years experience in the profession. - Experience with public financial and accounting operations; - Experience in management and financial execution of projects financed by external resources.
Agroforestry and Resilient Production Specialist	<ul style="list-style-type: none"> - Implement the actions of the respective component; - Guide the execution teams of the activities of this component; - Provide technical support to the preparation and execution of productive investment proposals; - Integrate the Commission and Analysis and Approval of Plans within the scope of the SIU; - Ensure the inclusion of women, young people and ethnic groups, as provided for in the Project; - Ensure compliance with ESS safeguards; - Support the management of contracts subordinated to the component. 	<ul style="list-style-type: none"> - Ability to work in an integrated manner with the SIU and other partners; - Knowledge of public policies for rural development, markets and productive arrangements for family farming; - Knowledge and practice in preparing proposals for rural productive investments and technologies adapted to the semiarid, aimed at agroforestry and resilient production. 	<ul style="list-style-type: none"> - Higher level professional preferably in the areas of agroecology, agronomy and the like, with knowledge in agricultural and non-agricultural productive activities developed in the semiarid region of Brazil; - Ability to use information technology, preferably georeferencing. 	<ul style="list-style-type: none"> - Experience of at least 5 years in the profession. - Experience in technical advisory activities in productive projects in the semiarid region, aimed at resilient and agroforestry production. - Experience in ESS compliance is desirable.

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
Youth, Gender and traditional communities Specialist	<ul style="list-style-type: none"> - Develop a strategy and action plan for the inclusion of young people and gender equity and for serving traditional communities, in the actions and activities of the project; - Ensure the gender focus across the board in the development of the component's activities; - Ensure compliance with ESS safeguards; - Stimulate and guide the involvement of women and young people in the project activities; - Training of Project teams and technical advisory partner teams on the themes of gender, youth and traditional communities; - Strengthen an environment of debate in communities about the role of men and women in family and youth agriculture; - To elaborate didactic and pedagogical instruments based on the principles and methodology of the Project, to contribute in the processes of discussion and formation of the teams; - Establish a relationship with other projects and programs to enable mobilization actions, access to markets and public policies; - Prepare reports of implementation of actions. 	<ul style="list-style-type: none"> - Ability to work in a team; - Ability to communicate and negotiate with family farmers and their organizations and with Project teams; - Knowledge of public policies for rural and social development; - Knowledge in the formulation and execution of plans for the development of human and organizational capacities and in participatory methodologies. 	<ul style="list-style-type: none"> - Higher level professional preferably in the areas of humanities and social sciences; - With at least one specialization course in the areas of interest; - With technical courses in the areas of interest; - Ability to use information technology. 	<ul style="list-style-type: none"> - 5 years experience in the profession; - Experience with the formulation and execution of development plans and in strengthening human and institutional capacities; - Experience with activities focused on gender, youth participation and inclusion of traditional communities. - Experience in ESS compliance is desirable.

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
Communication and Knowledge Management Specialist	<ul style="list-style-type: none"> - Develop project communication plan; - Develop project knowledge management plan; - Support local teams in mobilizing communities and their organizations to participate in actions related to their activities in the Project; - Provide technical guidance to local teams in supporting the preparation of Communication and Knowledge Management Plans; - Prepare reports of execution of actions for the SIU. 	<ul style="list-style-type: none"> - Ability to work in a team; - Ability to communicate and articulate with the project teams and with family farmers and their organizations; - Knowledge of public policies for rural and social development; - Knowledge in the formulation and execution of Communication Plans and Knowledge Management. 	<ul style="list-style-type: none"> - Higher level professional preferably in the areas of communication, humanities and social sciences; - Ability to use information technology. 	<ul style="list-style-type: none"> - 4 years experience in the profession; - Experience in the project communication area; - Experience with knowledge management; - Experience in formulating plans and implementing communication and knowledge management actions.
M&E Specialist	<ul style="list-style-type: none"> - Prepare a Term of Reference for contracting the design and implementation of the Project's computerized M&E system; - Monitor the elaboration and implementation of the system; - Provide technical support to the team in the use of the system; - Provide technical guidance to Project teams to systematically obtain information on monitoring planned and performed actions; - Integrate the Commission and Analysis and Approval of Plans within the scope of the SIU; - Interact with the Coordination and other areas for the effectiveness of Monitoring and Evaluation. 	<ul style="list-style-type: none"> - Ability to interact with the team providing the necessary technical guidance; - Knowledge in design, adaptation and implementation of M&E computer systems; - Knowledge of rural development projects. 	<ul style="list-style-type: none"> - Higher education professional preferably in the areas of humanities and social sciences, geography, administration, information technology and engineering, with knowledge in evaluating and monitoring rural and social development projects; - Domain in the use of management information systems technology. 	<ul style="list-style-type: none"> - 5 years experience in the profession; - Experience with project monitoring and evaluation. - Experience in designing and implementing a management information system.

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
M&E Analyst	<ul style="list-style-type: none"> - Support the elaboration of a Term of Reference for contracting the design and implementation of the Project's computerized M&E system; - Support the monitoring of the elaboration and implementation of the system; - Provide technical support to the team in the use of the system; - Provide technical guidance to Project teams to systematically obtain information on monitoring planned and performed actions; - Integrate the Commission and Analysis and Approval of Plans within the scope of the SIU; - Interact with the Coordination and other areas for the effectiveness of Monitoring and Evaluation. 	<ul style="list-style-type: none"> - Ability to interact with the team providing the necessary technical guidance; - Knowledge in design, adaptation and implementation of M&E computer systems; - Knowledge of rural development projects. 	<ul style="list-style-type: none"> - Higher education professional preferably in the areas of humanities and social sciences, geography, administration, information technology and engineering, with knowledge in evaluating and monitoring rural and social development projects; - Domain in the use of management information systems technology. 	<ul style="list-style-type: none"> - 3 years experience in the profession; - Experience with project monitoring and evaluation. - Experience in designing and implementing a management information system.
FIELD TEAM				
Local SIU Supervisor	<ul style="list-style-type: none"> - Supervise the implementation of the respective component; - Guide and supervise the teams responsible for the execution of the component's activities; - Provide technical support to the preparation and execution of productive investment proposals; - Integrate the Commission and Analysis and Approval of Plans within the scope of the SIU; - Ensure the inclusion of women, young people and ethnic groups, as provided for in the Project; - Support the management of contracts subordinated to the component. 	<ul style="list-style-type: none"> - Ability to coordinate / supervise teams and to work in an integrated way with the SIU and other partners; - Knowledge of public policies for rural development, markets and productive arrangements for family farming; - Knowledge and practice in preparing proposals for rural productive investments and technologies adapted to the semiarid region. - Knowledge in agroforestry and resilient production activities. 	<ul style="list-style-type: none"> - Higher education professional preferably in the areas of agroecology, agronomy, economics and the like, with knowledge in agricultural and non-agricultural productive activities developed in the semiarid region of Brazil; - Desirable specialization course in the area of interest of the project; - Ability to use information technology, preferably georeferencing. 	<ul style="list-style-type: none"> - Experience of at least 5 years in the profession. - Experience in technical advisory activities in productive projects in the semiarid region; - Experience in agroforestry and resilience activities.

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
Agroforestry and Resilient Production Specialist	<ul style="list-style-type: none"> - Implement the actions of the respective component; - Guide the execution teams of the activities of this component; - Provide technical support to the preparation and execution of productive investment proposals; - Integrate the Commission and Analysis and Approval of Plans within the scope of the SIU; - Ensure the inclusion of women, young people and ethnic groups, as provided for in the Project; - Ensure compliance with ESS safeguards; - Support the management of contracts subordinated to the component. 	<ul style="list-style-type: none"> - Ability to work in an integrated manner with the SIU and other partners; - Knowledge of public policies for rural development, markets and productive arrangements for family farming; - Knowledge and practice in preparing proposals for rural productive investments and technologies adapted to the semiarid, aimed at agroforestry and resilient production. 	<ul style="list-style-type: none"> - Higher level professional preferably in the areas of agroecology, agronomy and the like, with knowledge in agricultural and non-agricultural productive activities developed in the semiarid region of Brazil; - Ability to use information technology, preferably georeferencing. 	<ul style="list-style-type: none"> - Experience of at least 5 years in the profession. - Experience in technical advisory activities in productive projects in the semiarid region, aimed at resilient and agroforestry production. - Experience in ESS compliance is desirable.
M&E Specialist	<ul style="list-style-type: none"> - Prepare a Term of Reference for contracting the design and implementation of the Project's computerized M&E system; - Monitor the elaboration and implementation of the system; - Provide technical support to the team in the use of the system; - Provide technical guidance to Project teams to systematically obtain information on monitoring planned and performed actions; - Integrate the Commission and Analysis and Approval of Plans within the scope of the SIU; - Interact with the Coordination and other areas for the effectiveness of Monitoring and Evaluation. 	<ul style="list-style-type: none"> - Ability to interact with the team providing the necessary technical guidance; - Knowledge in design, adaptation and implementation of M&E computer systems; - Knowledge of rural development projects. 	<ul style="list-style-type: none"> - Higher education professional preferably in the areas of humanities and social sciences, geography, administration, information technology and engineering, with knowledge in evaluating and monitoring rural and social development projects; - Domain in the use of management information systems technology. 	<ul style="list-style-type: none"> - 5 years experience in the profession; - Experience with project monitoring and evaluation. - Experience in designing and implementing a management information system.

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
Communication and KM Specialist	<ul style="list-style-type: none"> - Develop project communication plan; - Develop project knowledge management plan; - Support local teams in mobilizing communities and their organizations to participate in actions related to their activities in the Project; - Provide technical guidance to local teams in supporting the preparation of Communication and Knowledge Management Plans; - Prepare reports of execution of actions for the SIU. 	<ul style="list-style-type: none"> - Ability to work in a team; - Ability to communicate and articulate with the project teams and with family farmers and their organizations; - Knowledge of public policies for rural and social development; - Knowledge in the formulation and execution of Communication Plans and Knowledge Management. 	<ul style="list-style-type: none"> - Higher level professional preferably in the areas of communication, humanities and social sciences; - Ability to use information technology. 	<ul style="list-style-type: none"> - 4 years experience in the profession; - Experience in the project communication area; - Experience with knowledge management; - Experience in formulating plans and implementing communication and knowledge management actions.

STATE LEVEL				
Function	Key Responsibilities	Profile	Educational Requirements	Professional Experience
Youth, gender and traditional communities' specialist	<ul style="list-style-type: none"> - Develop a strategy and action plan for the inclusion of young people and gender equity and for serving traditional communities, in the actions and activities of the project; - Ensure the gender focus across the board in the development of the component's activities; - Stimulate and guide the involvement of women and young people in the project activities; - Ensure compliance with ESS safeguards; - Training of Project teams and technical advisory partner teams on the themes of gender, youth and traditional communities; - Strengthen an environment of debate in communities about the role of men and women in family and youth agriculture; - To elaborate didactic and pedagogical instruments based on the principles and methodology of the Project, to contribute in the processes of discussion and formation of the teams; - Establish a relationship with other projects and programs to enable mobilization actions, access to markets and public policies; - Prepare reports of implementation of actions. 	<ul style="list-style-type: none"> - Ability to work in a team; - Ability to communicate and negotiate with family farmers and their organizations and with Project teams; - Knowledge of public policies for rural and social development; - Knowledge in the formulation and execution of plans for the development of human and organizational capacities and in participatory methodologies. 	<ul style="list-style-type: none"> - Higher level professional preferably in the areas of humanities and social sciences; - With at least one specialization course in the areas of interest; - With technical courses in the areas of interest; - Ability to use information technology. 	<ul style="list-style-type: none"> - 5 years experience in the profession; - Experience with the formulation and execution of development plans and in strengthening human and institutional capacities; - Experience with activities focused on gender, youth participation and inclusion of traditional communities. - Experience in ESS compliance is desirable.

APPENDIX 04 – RESILIENCE INDEX AND SCORECARD (DRAFT)

To understand and monitor the progress in building resilience capacities of family farming households in the NEB a resilience scorecard and index has been developed in the below table, which will be adjusted at project start-up through discussions with project stakeholders. The table links risks and vulnerabilities existing in the baseline scenario that the project seeks to address (columns 1 and 2) with the project's interventions to address these (column 3), the expected effects in terms of resilience capacities of the families participating in and benefiting from the interventions (column 4), and monitoring questions and scores that will be used for the resilience index tailored to the project (column 5). The monitoring questions will allow for assessing if the families have adopted the outputs of the project and are acquiring the desired resilience capacities. This index and its variables represented in the questions will allow the PCR and its beneficiaries to monitor progress in creating family resilience capacities and take action to adjust, if some activities are not being adopted by the families or are not achieving the intended results. The questions will be fine-tuned and included in the questionnaire for the baseline study and repeated at midterm and at the end of the project. The questionnaire can also be applied as part of the TRIPS formulation process among the families in the involved communities as an input to the assessment of vulnerabilities and needs for resilience capacities to be addressed by the TRIPS.

Risk Type	Potential impacts and vulnerabilities	Project interventions	Expected resilience capacities	Monitoring questions and scores for the project's family resilience index
Social and institutional risks and resilience measures				
Low adaptation planning and action capacities	Even though most communities and family farmers in the NEB relate their suffering from water	Participatory formulation of TRIPs accompanied with capacity building in climate change risk management, adaptation and resilience building.	Participation in the TRIP formulation and implementation process will build participating families' capacities to understand current and future climate change risks, causes of	1. Has anyone from your household participated in discussions and meetings for the formulation of a TRIP (or a similar adaptation plan) for the area you

	scarcity to climate change, they are not taking part in joint processes to analyse their vulnerabilities and identify adaptation options and actions with a comprehensive territorial approach		vulnerabilities linked to management and use of their landscapes and productive resources, and adaptation and resilience building options. This will allow them to plan and take collective and individual actions to improve their resilience including in future iterations of the risk assessment and planning process.	live and farm in? (Yes=1 point, No=0 point) 2. Can you mention adaptation or climate resilience practices/activities priorities in this TRIP? (> 2 Practices/activities = 2 points, 1-2 practices/activities = 1 point, 0 practices/activities = 0 point) <i>A list of eligible practices to be developed as a support for the interviewer.</i>
Lack of land tenure security	Many family farmers and indigenous, quilombolas and Fundo Pasto communities do not have tenure security to their lands, which makes them vulnerable to encroachment from other actors	The participatory mapping and planning exercise, as part of the development of the TRIPs, will include conflict mediation and resolution over the use of resources if needed. The project will provide legal and notary support to project's beneficiary communities for the registration of their land.	The communities and family farmers have improved land tenure security providing them with a basic incentive to invest in resilience measures in their land and farming systems.	3. Do you or your community have a registered land title? (Yes=1 point, No=0 point)

	and reduce their incentives to invest in CRPS and conservation measures	Interested communities or individual beneficiaries will be supported in obtaining a CAR.		
Gender based discrimination	Women are not participating in project activities and do not receive the benefits. The exclusion of half of the adult population and important users and potential protectors of agroecosystems reduces the adaptation capacities of the families and the communities	<p>The project has a Gender Assessment and Action Plan that is mainstreamed in project activities and is an important complement to the ESMP. Some key actions are:</p> <p>All project personnel will have training in gender sensitive approaches and avoidance of gender biases and discrimination</p> <p>Direct targeting strategies will be applied and their effectiveness monitored for the inclusion of women</p> <p>40% of technical assistance team will be women.</p> <p>Specific training for women on CRPS technologies and practices and encourage and support to</p>	Both men and women (at least 40% of beneficiaries) from beneficiary families participate in implementing activities promoting resilience of their agroecosystems and their families.	<p>4. Who of the adults in your household participate in the implementation of practices and measures that can decrease the impacts from climate events on your access to food and income? (only men participate = 0 points, women and men or only women for women headed HHs = 1 point)</p> <p><i>The question will not apply for HH without women. A list of eligible practices and measures to be developed as a support for the interviewer.</i></p>

		<p>women in becoming farmers-trainers</p> <p>Implementation of productive activities with women focused on the cultivation of nutritionally-rich foods in backyard gardens and other productive spaces, including native, rustic edible plants that are more resilient in semiarid conditions</p> <p>Promotion of seed banks” operated by women as a mechanism for validating the native knowledge of heirloom seeds, involving women directly in such efforts.</p>		
Exclusion of youth	<p>Young people are not participating in project activities and do not receive the benefits, making them more prone to migration. The exclusion of youth</p>	<p>Specific strategies will be implemented to encourage youth participation in the development and implementation of the TRIPs such as the use of youth focus group discussions to capture their ideas and aspirations to be included in the TRIPs</p>	<p>Youth from beneficiary families (at least 50% of beneficiaries of which 50% are young women) from beneficiary families participate in activities supporting the implementation of CRPS.</p>	<p>5. Has the households’ children participated in activities experimenting with CRPS in their school? (Yes=1 point, No=0 point)</p> <p><i>The question will not apply for HH without children</i></p> <p>6. Do at least one of the households’ youth (15-29 years) participate in activities</p>

	<p>and the strength and innovativeness they potentially represent reduces the adaptation capacities of the families and the communities.</p>	<p>Youth rural educational institutions will be supported in developing and implementing curricula for teaching and experimenting with CRPS.</p> <p>Youth will be involved in young communicators networks being trained in and responsible for facilitating production of audio-visual and printed materials to support CRPS and development of a participatory audio-visual monitoring model all in close collaboration with TA teams and community-based partner organizations</p> <p>Youth will also be involved in short-term professional courses in CRPS and will subsequently be incorporated in TA teams and serve as liaisons with families</p> <p>Finally, youth will also be an important part of the target group for the small grant support for micro enterprises and entrepreneurship in businesses</p>	<p>supporting CRPS and what are these activities? (Yes=1 point, No=0 point)</p> <p>7. Does the youth's participation in these activities contribute to the households' access to food and/or income? (Yes=1 point, No=0 point)</p> <p><i>The questions will not apply for HH without youth. A list of eligible activities to be developed as a support for the interviewer.</i></p>
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		that support the upscaling of CRPS		
Lack of diversity in food and income sources	<p>Farming families, who only have one income source and/or a few food sources are at higher risk of deeper impacts from climate shocks and stresses and needs more time and support to recover. Limited access to food sources does not allow for diverse healthy diets making the families more vulnerable to impacts from diseases and less strong to cope with shocks.</p>	<p>The project recognizes that increasing the diversity in income and food sources is one of the more effective ways of building the resilience of rural families.</p> <p>Through the promotion of CRPS, the project will support family farmers and communities in diversifying their crop-livestock farming systems to increase food and income sources. At the same time, The diversification in the CRPS system is a main element in the resilience of these systems themselves. The integration of different crops and livestock allows for the recycling and optimization in the use of biomass, nutrients, water and energy.</p> <p>The project will also provide small grants to support the start-up of small micro enterprises and</p>	<p>The number of income and food sources has increased for beneficiary families allowing them to spread risks and experience more stability in income and access to a diversity of food.</p>	<p>Which of the following sources does the household have providing an important income for the family economy?</p> <p>8. - Selling of 1-2 agricultural produce (1 point)</p> <p>- Selling of 3 agricultural produce (2 points)</p> <p>- Selling of 4 or more agricultural produce (3 points)</p> <p>9. - salary from temporal jobs (0.5 points for each household member with temporal jobs providing an important contribution to the family economy, Max 2 points)</p> <p>10. - salary from full time job (1 point for each household member with full time job providing an important contribution to the family economy, max 2 points)</p>

		entrepreneurship in businesses that support the upscaling of CRPS and opens new income generating opportunities.		<p>11. - stable income from micro enterprise (yes = 1 point)</p> <p>12. How many types of food do your family consume regularly from your farm or local market during a normal week? (If all food groups are adequately covered = 2 points, if at least 70% of the food groups are adequately covered = 1 point, less than 70% = 0 point)</p> <p><i>A list of context adapted food groups to be covered for a healthy diversified diet will be developed with a nutritionist and the scores adapted. Alternatively, the Minimum Dietary Diversity for Women indicator may be used.</i></p>
Low capacity to cope and recover after stress and shocks from droughts	The hotter and dryer climate will lead to periodic droughts causing crisis in the family economy and access to food	All the project interventions are focused at building the families capacities to be less impacted from these crisis and be able to recover faster.	Families participating in the formulation of TRIPs for their territories, adopting CRPS at farm and landscape level, and participating in different income generating micro enterprises	If the next two years should be just as dry with minimum rainfall, as you experienced in 2018 and 2019, how would it affect your family in terms of:

			have better resilience capacities to cope with crisis.	<p>13. Impact on your family income worse or the same as in 2018/19? (Yes=0 point, No=1 point)</p> <p>14. Impact on your access to a diversity of food worse or the same as 2018/19? (Yes=0 point, No=1 Point)</p> <p>15. Has one or more family member a bank account with savings that can be used in drought crisis periods? (Yes=1 point, No=0 point)</p> <p>16. Does the family have a relative that can send money in times of crisis? (Yes=1 point, No=0 point)</p> <p>17. Is one or more family member a member of a social or economic group or network that supports its member families in times of crisis through a credit or a donation? (Yes=1 point, No=0 point)</p>
Climate risks, agroecosystem fragility and resilience measures				

Increasing temperatures and rainfall variability and overall reduction in annual average rainfall	Increased evapotranspiration and crop water needs, prolonged dry spells and droughts and increased scarcity of water resources for crop, livestock and human needs. Increasing vulnerability for family farmers primarily dependent on agriculture with adverse impacts on their food security and nutrition and income generation.	<p>The project will support increased access to water through rainwater harvesting and storage structures</p> <p>Water use efficiency in irrigation and through the use of less water demanding crops and planting schemes</p> <p>Treatment and reuse of household waste water for vegetable gardening (grey water) and fruit trees and non-eatable plants (black water).</p>	Sustainable access to water resources covering household, livestock and crop farming needs and minimizing yield losses during prolonged dry seasons and droughts.	<p>18. Do your household have access to a secure and quality water source (rainwater harvested and stored and irrigation equipment) for at least 0.2 hectares of land for production during the dry season? (yes=1 point, No=0 point)</p> <p>19. Do you use drip irrigation or other water-use efficient systems? (yes=1 point, No=0 point)</p> <p>20. Do you have an irrigated fruit and vegetable garden regularly providing food for the family? (Yes=1 point, No=0 point)</p>
Soil erosion and reduced drought	Hotter and dryer climate increases soil dryness and erosion risks.	The CRPS promoted by the project include a variety of practices to avoid soil erosion and improve the soils physical and	Family farmers adoption of CRPS practices on their farms will	21. Is your family adopting CRPS practices on at least 2/3 of your crop land and what are these practices? (> 2 Practices = 3

buffering capacity	Unsustainable cropping and grazing practices may further affect the soil health and its ability to store and filtrate water and sustain biomass productivity, leading to declining yields and ultimately desertification and adverse impacts on family farmers' and communities' food security and nutrition and income generation.	chemical characteristics on farmland: (i) avoid building water harvesting structures and other infrastructure in the wet season to avoid soil erosion; (ii) identification and containment and monitoring of existing and new erosive processes; (iii) reduced tillage, increased vegetation soil coverage, and reintegration of biomass, manure and use of green fertilizers in cropland; (iv) crop diversification, stratification; (v) integration of tree species as wind shields and provider of biomass in cropping systems; (vi) contour planting; etc.	stabilize and over time increase yields from a variety of crops.	points, 1-2 practices = 2 point, 1 practice = 1 point, 0 practices = 0 point) <i>A list of eligible practices to be developed as a support for the interviewer.</i> 22. Has the introduction of these practices supported your family in having more stable total harvest from your land? (Yes=1 point, No=0 point) 23. Has the introduction of these practices supported your family in having an increase in total harvest from your land? (Yes=1 point, No=0 point)
Reduced vegetation cover at landscape level	Reduction in vegetation cover increases soil dryness, its inability to sustain	In order to avoid the fragmentation of the remnants and eventual changes in the composition and structure of the Caatinga vegetation, the project	Family farming, indigenous and traditional communities' adoption of CRPS practices in their landscapes will sustain the regeneration of biomass,	24. Is any member participating in community activities and practices to manage the use and protection of the landscape in your area (protection of the

	<p>biomass production, and erosion and desertification risks. At landscape level it affects habitats and biodiversity, water availability and the resilience of the ecosystem services family farmers and communities are dependent on.</p>	<p>promote the adoption of CRPS at landscape level including a variety of practices: (i) facilitate community decisions and implementation of land use zoning and use-regulations (crop production, pasture, housing and urbanized area, water protection, among others); (ii) mapping, classification of natural vegetation coverage, and conservation of remaining forest fragments of the region avoiding conversion of any new areas for crop production, and when needed assists its natural regeneration; (iii) sustainable grazing practices</p>	<p>availability of animal feed, and the availability of water.</p>	<p>vegetation cover, forest areas, endangered species, sustainable grazing)? (Yes = 1 point, No = 0 point)</p> <p><i>A list of eligible practices to be developed as a support for the interviewer.</i></p> <p>25. Has the introduction of these practices supported your family in having more stable access to fodder for your animals? (Yes=1 point, No=0 point)</p> <p>26. In your opinion, has the introduction of these practices supported the availability of water resources in the landscape for animals, plants and for the water harvesting structures? (Yes=1 point, No=0 point)</p>
Total maximum score:				34 points (1point =2.94%)

APPENDIX 05 – GENERAL TEMPLATE OF THE ANNUAL PERFORMANCE REPORT (APR)

Reference Number (FP###): Funding Proposal Title

Accredited Entity Name

Annual Reporting Period Covered in this Report:

(From DD-MM-YYYY to DD-MM-YYYY)

Sections in this report:

- Section 1: General Information
- Section 2: Implementation Progress Report
- Section 3: Financial Information²² (Excel worksheet attached).
- Section 4: Report on Environmental and Social Safeguards & Gender
- Section 5: Annexes
- Section 6: Attachments

Please submit the APR to pmu@gcfund.org

²² Please refer to excel worksheet attached “APR Section 3 (Financial Information)”. Provide as attachments to this report detailed financial information per the established requirements in the Funded Activity Agreement.

SUBMITTED BY	
<i>Name and title</i>	<i>Date</i>

FOR GREEN CLIMATE FUND'S SECRETARIAT USE ONLY		
Received by:	<i>Signature</i>	<i>Date (DD-MM-YYYY)</i>

SECTION 1: GENERAL INFORMATION	
This section provides general information on the funded activity.	
1. Funded Activity Title:	<i>As per the approved Funding Proposal</i>
2. Funding Proposal Number:	<i>(FP###)</i>
3. Date of Board approval - Board Meeting Number:	Click or tap to enter a date.Click or tap to enter a date.Click or tap to enter a date. <i>B.XX</i>
4. Accredited Entity:	<i>(Full name of the Accredited Entity)</i>
5. Focal Point of the Accredited Entity for this Project:	<i>(Full name/email/telephone number)</i>
6. Executing Entity(ies):	<i>(Full name of the Executing Entity(ies))</i>
7. Implementation Period:	<i>From:</i> Click or tap to enter a date.Click or tap to enter a date.Click or tap to enter a date. <i>To:</i> Click or tap to enter a date.
8. Current year of Implementation:	<i>(e.g. year 2)</i>

9. Closing Date²³:	Click or tap to enter a date.Click or tap to enter a date.Click or tap to enter a date.
10. Investment Manager²⁴:	<i>(e.g. John Doe)</i>
11. Investment Period²⁵:	<p>From: Click or tap to enter a date.Click or tap to enter a date.</p> <p>To: Click or tap to enter a date.</p>
12. Date of Submission of the Report:	Click or tap to enter a date.Click or tap to enter a date.
13. Annual Reporting period covered in this report:	<p>From: Click or tap to enter a date.Click or tap to enter a date.</p> <p>To: Click or tap to enter a date.</p>
14. Total Project Budget²⁶:	<p><i>(e.g. Loan: USD 25,000,000</i></p> <p><i>Grant: USD 5,000,000)</i></p>
15. Total amount of GCF Proceeds Approved:	<p><i>(e.g. Loan: USD 20,000,000</i></p> <p><i>Grant: USD 2,500,000)</i></p>
16. Total amount of GCF Proceeds disbursed (cumulative) to the Accredited Entity:	<p><i>(e.g. Loan: USD 2,000,000</i></p> <p><i>Grant: USD 500,000)</i></p>

SECTION 2: IMPLEMENTATION PROGRESS REPORT

²³ Refers to the date on which the Accredited Entity's right to receive Disbursements in respect of the Funded Activity will terminate, as defined in the relevant Funded Activity Agreement.

²⁴ If applicable.

²⁵ If applicable.

²⁶ Total project budget including co-financing as approved by GCF.

2.1 OVERALL (SUMMARY) PROJECT PROGRESS REPORT (*less than one (1) page*²⁷).

Provide a narrative report describing the overall progress on the implementation of the funded activity, focusing on implementation achievements, delays and challenges according to the planned activities. The narrative should contain considerations on the performance of the Funded Activity against the [Fund's Investment and the Results Management frameworks](#). As relevant, include references to other sections of this report (including Annexes or Attachments).

Include a description of key milestones of the funded activity achieved during this reporting period. Also, describe actions undertaken, challenges encountered and lessons learned during the implementation, including issues related to non-compliance with GCF standards or conditions, if any. In parallel, include positive achievements and better-than-expected results.

In case of key issues that may result in a change of the scope of the project, please provide a description of such elements and considerations on the implementation period and final targets.

²⁷ Please remove text below to fit report to one page. Additional reports can be provided as other attachment to the APR.

2.2 PROJECT OUTPUTS IMPLEMENTATION STATUS					
Project Output	Project Activity	Status ²⁸	Deliverable/Milestone for the current reporting period ²⁹	Deliverable/Milestone for the next reporting period ³⁰	Remarks (as applicable) ³¹
Output 1 (e.g. 1 Wind power generation plant commissioned)	1.1 (e.g. Sign Power Purchase Agreement (PPA))	Choose an item.	(e.g. PPA on negotiation)	(e.g. PPA signed)	
	1.2 (e.g. Procurement of EPC contractor)	Choose an item.			
	1.3 (e.g. Execution of EPC contract)	Choose an item.			
	1.4 (e.g. Commissioning)	Choose an item.			
Output 2 (e.g.: Project management capacity is)	2.1 (e.g. Project Office support (contracting of key personnel))	Choose an item.			
	2.2 (e.g. Procurement of supervision consultants)	Choose an item.			

²⁸ Activity Not Yet Due; Activity Started -ahead of schedule; Activity started – progress on track; Activity started but progress delayed; Activity start is delayed.

²⁹ Please provide all relevant specific inputs, milestones and deliverables relevant to the reporting period.

³⁰ Please provide all relevant specific inputs, milestones and deliverables relevant to the next reporting period.

³¹ For Activities delayed, provide the respective explanation/justification.

<i>strengthened)</i>	<i>2.3 Etc.</i>	Choose an item.			
<i>Output 3 Etc.</i>	<i>3.1 Etc.</i>	Choose an item.			

2.3 PROGRESS UPDATE ON PROJECT INDICATORS OF THE LOGIC FRAMEWORK ³²						
2.3.1 PROGRESS UPDATE ON FUND-LEVEL IMPACT INDICATORS OF THE LOGIC FRAMEWORK ³³						
<i>Fund-level impact Core indicators (Mitigation)</i>	<i>Baseline</i>	<i>Current value³⁴</i>	<i>Target (mid-term)</i>	<i>Target (final)</i>	<i>Variances from target (if any)</i>	<i>Variance from proposed methodology³⁵ (if any)</i>
<u>Mitigation Core Indicator 1</u> <i>Tonnes of carbon dioxide equivalent (tCO₂eq) reduced as a result of Fund-funded projects/programmes</i>	<i>Annual</i>	<i>Annual</i>	<i>Annual</i>	<i>Annual</i>		
	<i>Lifetime</i>	<i>Lifetime</i>	<i>Lifetime</i>	<i>Lifetime</i>		
<u>Mitigation Core Indicator 2</u> <i>Cost per tCO₂eq decreased for all Fund-funded mitigation projects/programmes</i>						
<u>Mitigation Core Indicator 3</u>	<i>Public</i>	<i>Public</i>	<i>Public</i>	<i>Public</i>		
	<i>Private</i>	<i>Private</i>	<i>Private</i>	<i>Private</i>		

³² Per the approved Logic Framework of the Funding Proposal, please provide an update on the relevant indicators. Provide as Annex 2 an explanation of the methodology, including the main assumptions for each indicator.

³³ As per the relevant indicators following the Performance Measurement Framework established in the Funding Proposal and in relation to the indicators in Section 2.3.2, including relevant updates agreed with GCF, if applicable.

³⁴ As of 31 December of the relevant year.

³⁵ As applicable, in relation to the methodology described in the Funding Proposal.

<i>Volume of finance leveraged by Fund funding (Disaggregated by public/private source)</i>						
<u>Mitigation Impact Indicator 1</u> <i>(E.g. *Tonnes of carbon dioxide equivalent (tCO2eq) reduced or avoided emissions through increased low-emission energy access and power)</i>						
<u>Mitigation Impact Indicator 2</u> <i>Etc.</i>						

<i>Fund-level impact indicators (Adaptation)</i>	<i>Baseline</i>	<i>Current value³⁶</i>	<i>Target (mid-term)</i>	<i>Target (final)</i>	<i>Variances from target (if any)</i>	<i>Variance from proposed methodology³⁷ (if any)</i>
<u>Adaptation Core Indicator</u> <i>Direct Beneficiaries³⁸</i>	<i>Total direct beneficiaries (% of female)</i>	<i>Total direct beneficiaries (% of female)</i>	<i>Total direct beneficiaries (% of female)</i>	<i>Total direct beneficiaries (% of female)</i>		

³⁶ As of 31 December of the relevant year.

³⁷ As applicable, in relation to the methodology described in the Funding Proposal.

³⁸ As defined in the Funding Proposal for the project.

Fund-level impact indicators (Adaptation)	Baseline	Current value³⁶	Target (mid-term)	Target (final)	Variances from target (if any)	Variance from proposed methodology³⁷ (if any)
<u>Adaptation Core Indicator</u> <i>Indirect Beneficiaries³⁹</i>	<i>Total indirect beneficiaries (% of female)</i>	<i>Total indirect beneficiaries (% of female)</i>	<i>Total indirect beneficiaries (% of female)</i>	<i>Total indirect beneficiaries (% of female)</i>		
<i>Number of total beneficiaries relative to total population⁴⁰</i>	<i>Total beneficiaries</i> <i>Number of Total Population</i> <i>Year: YYYY</i>	<i>Total beneficiaries</i> <i>Number of Total Population</i> <i>Year: YYYY</i>	<i>Total beneficiaries</i> <i>Number of Total Population</i> <i>Year: YYYY</i>	<i>Total beneficiaries</i> <i>Number of Total Population</i> <i>Year: YYYY</i>		
<u>Adaptation Impact Indicator 1</u>						

³⁹ As defined in the Funding Proposal for the project.

⁴⁰ Relative to the total population of the country.

Fund-level impact indicators (Adaptation)	<i>Baseline</i>	<i>Current value³⁶</i>	<i>Target (mid-term)</i>	<i>Target (final)</i>	<i>Variances from target (if any)</i>	<i>Variance from proposed methodology³⁷ (if any)</i>
<i>(E.g. Number of males and females benefiting from introduced health measures)</i>						
<u>Adaptation Impact Indicator 2</u> <i>Etc.</i>						

2.3.2 PROGRESS UPDATE ON PROJECT/PROGRAMME LEVEL INDICATORS OF THE LOGIC FRAMEWORK⁴¹							
Project/Programme indicators (Mitigation/Adaptation)	<i>Baseline</i>	<i>Current value⁴²</i>	<i>Target (mid- term)</i>	<i>Target (final)</i>	<i>Implementation Status⁴³</i>	<i>Explanations if variances from target</i>	Remarks (as applicable)⁴⁴
Indicator 1 (Outcome level) (Mitigation/Adaptation)					Choose an item.		

⁴¹ As per the relevant indicators following the Performance Measurement Framework and other indicators as established in the Funding Proposal, including relevant updates agreed with GCF, if applicable.

⁴² As of 31 December of the relevant calendar year.

⁴³ Not Yet Due; Started -ahead of schedule; Started – progress on track; Started but progress delayed; Start is delayed.

⁴⁴ For Activities delayed, provide the respective explanation/justification.

<i>(e.g. 6.3 Mitigation: MWs of low-emission energy capacity installed, generated and/or rehabilitated as a result of GCF support)</i>							
Indicator 1 (Output level) <i>(e.g. Wind power generation plant commissioned)</i>					Choose an item.		
Indicator 1.1 <i>(e.g. Sign Power Purchase Agreement (PPA))</i>					Choose an item.		
Indicator 1.2					Choose an item.		
Indicator 1.3, etc.					Choose an item.		
Indicator 2 (Outcome level) <i>(Mitigation/Adaptation)</i>					Choose an item.		
Indicator 2 (Output level)					Choose an item.		
Indicator 2.1					Choose an item.		
Indicator 2.2, etc.					Choose an item.		

2.4 IMPLEMENTATION TIMETABLE/MILESTONES FOR THE NEXT REPORTING PERIOD

Provide a timetable including milestones to be delivered for the next annual reporting period. This should be aligned with Section 2.2 and the project Implementation Timetable in Annex 1. Kindly specify milestones. Note that milestones for the next reporting period should be defined in more detail than originally planned since project managers should have a better idea of what milestones are to be achieved in their annual work plans than they may have had when the original project implementation timetable was included in the funding proposal.

Table below included for illustrative purposes.

TASK	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Output 1.												
Activity 1.1.	x	x	x(1)									
Activity 1.2.			x	x	x	x	x	x(2)				
Activity 1.3.			x	x	x(3)	x	x	x(4)				
...												
Output 2.												
Activity 2.1.							x	x	x	x	x	x(5)
Activity 2.2.							x	x(6)	x	x	x	x(7)
Activity 2.3.							x	x	x	x	x	x(8)

List of Milestones:

- (1) Milestone 1 Description.
- (2) Milestone 2 Description.
- (3) Etc.

2.5 IMPLEMENTATION CHALLENGES AND LESSONS LEARNED⁴⁵

Describe implementation challenges faced during the last reporting period, including measures adopted and lessons learned. In case of challenges that may result in a change of the scope of the project, please provide a description of such elements and considerations on the implementation period and final targets.

<i>Challenge encountered</i>	<i>Type⁴⁶</i>	<i>Measures adopted</i>	<i>Impact on the project implementation⁴⁷</i>	<i>Lessons learned and Other Remarks</i>
	Choose an item.		Choose an item.	
	Choose an item.		Choose an item.	

2.6 REPORT ON CHANGES DURING IMPLEMENTATION

Describe changes to the project during the reporting period. In particular, the report should cover elements such as change of beneficial ownership structure, management changes of the Accredited Entity, policies and other elements relevant for the project, and any other material change that could influence the overall outcome of the project.

⁴⁵ If applicable, if there were challenges faced during implementation.

⁴⁶ Implementation; Legal; Financial; Environmental/Social; Political; Procurement; Other; AML/CFT; Sanctions; Prohibited Practices.

⁴⁷ Minor/Solved; Moderate; High.

SECTION 3. FINANCIAL INFORMATION		
OVERVIEW OF THE FUNDED ACTIVITY (Please complete Sections 3.1 to 3.6 in Excel file "APR Section 3 Financial Information")	For the Reporting Period (EUR/USD/JPY/GBP)	Cumulative (EUR/USD/JPY/GBP)
Total Project Cost ⁴⁸ :		
Total GCF financing to the Project:		
Total Amount of GCF Proceeds Disbursed to AE:		
Grant component:		
Loan Component:		
Equity Component:		
Guarantee Component:		
Total Amount:		
Total Amount of Funds used for the Funded Activity ⁴⁹ :		
By Executing Entity 1:		
By Executing Entity 2, etc.:		
Total amount:		
Total Amount of Expenditures on the Funded Activity:		
Total Amount of funds Committed to the Funded Activity ⁵⁰ :		
Amount of Other Inflows received by the AE ⁵¹		
Total Amount of Reflowed Funds to GCF from AE:		
Closing balance of the AE for the Funded Activity ⁵² :		
Closing balance of the Executing Entity(ies) for the Funded Activity ⁵³ :		
Absorption Capacity ⁵⁴		
Please provide a brief explanation in the case of variances between the executed budget (annual and cumulative) and the approved project cost/budget/approved amount absorption capacity		

COUNTRY SPECIFIC INFORMATION		
Total Amount of GCF Proceeds Disbursed by the AE for each Target Country of the Project:		
Country 1:		
Country 2, etc.:		
Date of First Cash Disbursement of GCF Proceeds by the Executing Entity:		

SECTION 4: REPORT PROJECT SPECIFIC ON ENVIRONMENTAL AND SOCIAL

SAFEGUARDS & GENDER

4.1 IMPLEMENTATION OF ENVIRONMENTAL AND SOCIAL SAFEGUARDS AND GENDER ELEMENTS

(max 1 page)

⁴⁸ Total project cost/budget including GCF proceeds and co-financing. In reference to the approved amount (for each relevant year and cumulative) as per the FAA.

⁴⁹ Including GCF Proceeds and co-financing.

⁵⁰ Including GCF and co-financing. Refers only to the items as of the reporting date where the AE/EE has signed a binding contract and the relevant expenses are not yet incurred.

⁵¹ In relation to the Funded Activity, including bank interest earned, revenue from income generating activities, reflowed funds to the Accredited Entity, Value Added Tax/other tax refunds, proceeds from disposal of assets, etc.

⁵² As of the end of the relevant period, the Closing Cash Balance resulting from the opening Cash Balance plus total Inflows, minus total Outflows in relation to the Funded Activity. Please refer to the Closing Balance expressed in section 3.1 (excel sheet attached).

⁵³ As of the end of the relevant period, the Closing Cash Balance resulting from the opening Cash Balance plus total Inflows, minus total Outflows in relation to the Funded Activity.

⁵⁴ The rate of utilization of the project cost/budget, i.e. total amount of funds used for the funded activity in the period expressed as a percentage of the total project cost/budget for the corresponding period.

Please provide information on the project or programme ESMP monitoring activities undertaken during the implementation of the funded activity.

Provide a report on the implementation of environmental and social management plans (ESMPs) and frameworks (ESMFs) describing achievements, and specifying (i) outputs and activities implemented during the reporting period; (ii) key environmental, social and gender issues addressed during implementation; (iii) pending key environmental, social and gender issues needing accredited entity's actions and GCF attention; (iv) changes of law/regulation, political environment and auditing standards and; (v) a list of planned activities for the next reporting period. For Category C or I-3 projects or programmes, describe the results of further environmental and social screening and the measures taken, if any, to manage environmental and social risks.

Additionally, include a description of the actions undertaken towards increasing the relevant stakeholders' engagement in the project environmental, social and gender elements, and a list on the grievances received due to breaches in environmental and social standards or gender standards in the reporting period that will include at least the description of the grievance, the date the grievance was received, and the resolution of the grievance. In case of a change in the E&S risk category for the project, please provide an explanation.

4.2 GENDER AND SOCIAL ACTION PLAN

Provide a progress report on the gender and social action plan developed during project preparation stage for the reporting period (if applicable). Provide updated indicators based on the gender assessment and gender and social inclusion action plan of the project.

Indicate primary challenges and actions addressing gender inequalities, gender-based needs, equal of access to resources, services, and capacity development, as well as equal participation and benefits in the scope of the project. If available, incorporate both quantitative data and a qualitative assessment of the performance of such actions, and on progress in the gender and social inclusion action plan.

4.3 PLANNED ACTIVITIES ON ENVIRONMENTAL AND SOCIAL SAFEGUARDS

Provide a list of activities in the ESMP to be implemented in the next reporting period. Include relevant deliverables such as reports or action plans, and other project specific products. Please include the monitoring schedule concerning ESS and gender activities for the next annual reporting period.

4.4 PLANNED ACTIVITIES ON GENDER ELEMENTS

Provide a list of activities to be implemented in the next reporting period. Include relevant deliverables such as reports or action plans, and other project specific products. Please include the monitoring schedule concerning gender activities for the next annual reporting period.

SECTION 5: ANNEXES

Annex 1. Updated implementation timetable for the Funded Activity.

Annex 2. Impact indicator assessment methodology⁵⁵, including the main assumptions for each indicator.

Annex 3⁵⁶. Accredited Entity compliance reports (self-assessment reports⁵⁷, report on actions pursuant to Clause 18.02, if applicable⁵⁸).

SECTION 6: ATTACHMENTS

Attachment 1. Unaudited/Audited financial statements (as required by FAA).

(If available. If not submitted, indicate date of submission.)

Attachment 2. Interim/Final evaluation report (as required by FAA).

(If available. If not submitted, indicate date of submission.)

Other Attachments. As applicable, such as detailed budget tables⁵⁹, loan repayment schedules to GCF (interest/principal), equity investment schedules, periodic portfolio reports⁶⁰, statements of capital account, valuation reports, credit guarantee agreements, investor reports, and others, as specified in the relevant legal agreements (e.g. Funded Activity Agreement, Shareholders Agreement)

⁵⁵ Provide an update on the methodology used for estimating impact indicators, including assumptions, values, and relevant changes from the Funding Proposal, if any.

⁵⁶ These reports can be provided as annexes to the APR or as separate reports for convenience of the Accredited Entity.

⁵⁷ In accordance with the Monitoring and Accountability Framework, a self-assessment of its compliance, in accordance with Clause 13.01 of the Accreditation Master Agreement, with the Fiduciary Principles and Standards, ESS and Gender Policy.

⁵⁸ Only applicable to International Accredited Entities. In accordance with the Monitoring and Accountability Framework, a report on its actions carried out or planned to be carried out pursuant to Clause 18.02 of the Accreditation Master Agreement.

⁵⁹ As included in the FAA.

⁶⁰ Summary information with respect to each Portfolio Company, in addition to a summary of Financial Results for the reported annual period.

APPENDIX 06: GENDER AND YOUTH STRATEGIES

Gender strategy

Context

Gender inequality is a deeply pervasive issue across all smallholder production in the Brazilian Northeast. Women and men have different roles in guaranteeing food security and income for their households and communities, resulting in significantly weakened economic empowerment and decision making capacity for women, and unequal workload distribution. Women are deeply involved in activities within the domestic sphere and subsistence crop production; approximately 46.7% of rural women are involved in subsistence agricultural activities in Brazil compared to 14.0% of rural men. According to the national household sample survey (PNAD, 2013), the majority of rural women (90.8%) devote 26.1 hours per week to domestic work, while 43.1% of men dedicate only 10.2 hours per week to this type of work (JALIL et al., 2017, p.64). Women's daily work is made invisible by the fact that most of their transactions and actions are not monetized or calculated, given that they are often not inserted in formal markets. According to census data (IBGE, 2014), 45.5% of rural women are inserted in the labor market, compared with 72.2% of rural men. Although women participate in work dynamics within the productive sphere, working in almost all tasks of the property, they are generally excluded from decision making about the use of financial and natural resources, jeopardizing their personal and financial autonomy (SILIPANDRI; CITRÃO, 2011).

Furthermore, approximately 30% of households are led by women, with the aggravating fact that 60% of these women do not receive any support from the fathers of their children. These households very often have a higher poverty incidence. The majority of farmers producing in areas smaller than 5 hectares are women, and 87.3% of women farmers in Brazil do not have access to technical assistance services (OXFAM, 2016). According to Terrenos da Desigualdade (2016), of the total number of rural farmers without land, there are almost twice as many women as men. Men presently control 87.3% of rural properties in Brazil and 94.5% of the country's total rural area (OXFAM, 2018). Finally, there is an alarming prevalence of gender-based violence in Brazil, which is the result of sexist values deeply rooted in society (IACHR, 2019). Young, indigenous and women from traditional communities are often more disadvantaged.

National policies, strategies and actors

Main rural development policies and strategies	
Name	Issues related to gender
Brasil Sem Miséria	

Brazilian National Policy on Climate Change	
Gender-specific policies and strategies	
Plano Nacional de Políticas para as Mulheres (2013)	
Actors engaging in gender-issues	
Federal - Secretaria de Políticas para as Mulheres	
Federal - Ministry of Agrarian Development - Program for the Promotion of Gender, Race, and Ethnicity (PPIGRE)	
Civil Society – Rural Women Workers Movement of the Northeast (MMTR-NE)	
Civil Society – Movement of Women Farmers (MMAs)	
Civil Society – Movement of Peasant Women (MMC)	
Civil Society – Babassu Coconut Breakers Interstate Movement (MIQCB)	
Civil Society – Espacio Feminista	

Pathways

PCRP will take a holistic gender transformative approach that focuses on the economic, political, economic and cultural causes of vulnerability of different groups. It aims to transform power relations shaped by unequal patriarchal norms and practices, and to empower women so they have greater capacity to adapt. As such, the project will promote equal access to and control over resources and assets, address women's time poverty due to care and domestic work and open up spaces for discussion, collaboration, participation and decision-making.

Aim	To increase PCR's impact on gender equality and strengthen women's empowerment in the semiarid region of Northeast Brazil by transforming social and cultural norms regarding gender roles		
	At least 40 percent of the beneficiaries will be women		
Objectives	Economic empowerment	Decision-making and representation	Equitable workload balance
Activities	<ul style="list-style-type: none"> - Increasing women's access to and control over assets – natural resources, inputs, technologies and finance - and to economic services – such as extension, training and business development - through the promotion of climate-resilient productive systems in family farms, backyard gardens and bio-saline productive systems - New income opportunities for women emerging from seedbanks, the sustainable management of the Caatinga (seeds, nuts, fruits, forage, etc.) and support for micro-enterprises to supply small-scale equipment for CRPS - Creating new spaces/ opportunities/ markets and support for women's economic engagement - Sensitising men and boys as a strategy for supporting women's economic engagement 	<ul style="list-style-type: none"> - Ensure involvement of women in the development and implementation of Territorial Resilience Investment Plans - Ensure involvement of women in collective areas sustainable management - Leadership training for women - Encouraging and capacitating women to lead in non-traditional executive positions and to gain a voice through farmers' networks - Women will be encouraged to become farmer-trainers - Women-only groups will be promoted - Farmers' organisations will need to develop a gender strategy 	<ul style="list-style-type: none"> - Using "cadernetas agroecológicas" to engage household members in analysing and addressing gender inequalities in roles and stimulate discussions on redistributing household tasks among household members - Introduction of labour- and time-saving technologies (e.g. eco efficient stoves and biodigesters) - Increasing access to water - "Cirandas" initiative to allow for childcare during project activities - Engaging men in household nutrition
	Policy engagement on gender-based violence		
M&E	Project-level Women's Empowerment in Agriculture Index (pro-WEAI)		

Targeted sub-groups

Women in general constitute a main target group of PCR, with at least 40 percent of all beneficiaries being women. Nevertheless, there are a number of sub-groups that given their vulnerability will be specifically targeted:

- *Young women:* Rural girls are often left behind because of the triple challenges of age, location, and gender. Investing in rural girls—and ensuring their progress—will lead the Semi-Árido forward, thanks to the profound impact girls and women have on their communities and the multiplier effects. Of the activities targeting youth, at least 40 percent will target young women and girls. In addition, special attention will go to boosting their

self-esteem and self-confidence, strengthening their leadership skills and addressing issues of early pregnancy and gender-based violence.

- *Indigenous women and women from traditional communities:* Indigenous women and girls and those from traditional communities are amongst the most vulnerable within their communities, being victims of a triple discrimination based on gender, ethnicity and socioeconomic status. They are confronted with high levels of poverty; low levels of education and illiteracy; limitations in the access to health, basic sanitation, credit and employment; limited participation in political life; and the prevalence of domestic and sexual violence as some of the main issues confronting indigenous women. Still, indigenous women are the backbone of indigenous communities and play a crucial role in the preservation of food security. They also have a fundamental collective and community role as guardians of indigenous ancestral knowledge, having been traditionally carers of natural resources and managers of seeds and medicinal plants. In addition, they are often taking the lead in the defence of indigenous lands and territories and advocating for indigenous peoples' collective rights. PCR will support them in their role as guardians of knowledge, but also as "farmer-experimenter" or "agricultoras experimentadoras". Special measures will be taken to ensure their voices are heard in the development of the TRIPs and take up decision-making positions in the instances dealing with the management of natural resources, with a specific focus on Fundo de Pasto communities.
- *Female-headed households:* Female-headed households and farms lag their male counterpart in their access to and ownership of most inputs, assets and services that are relevant for productive activities in rural areas. The odds of food insecurity are reportedly higher among female-headed households compared to male-headed households in Brazil. PCR will therefore specifically target female-headed households confronted by poverty or food insecurity.

Disaggregated data will be collected to monitor their engagement in the project and take corrective measures if necessary.

Implementation arrangements

The following provisions have been taken to ensure the gender-responsiveness of project management:

- Development of a project gender strategy
- Setting of targets for women as a percentage of beneficiaries
- Allocation of budget for specific gender-related activities
- Recruitment of a full-time gender and social inclusion specialist in the project management team (to oversee the implementation of the gender strategy, provide staff capacity building, and support colleagues in

mainstreaming gender considerations into their operations, including knowledge management, M&E indicators and results measurement)

- Responsibility for mainstreaming gender will be included in the TORs of all key project staff
- Responsibility for mainstreaming gender will be included in TORs for service providers
- At least 40 percent of the officers providing technical support will be women
- Sex-disaggregated data will be collected and analysed
- Studies undertaken by the project will include a gender perspective
- A Pro-WEAI survey will be carried out at baseline, mid-term and endline
- Attention will be paid to ensuring the location, timing, materials, language and trainer of training events match women's availability and skills levels
- Gender- sensitive messages will be used in project communication, information campaigns and outreach events

Youth strategy

Context

The Brazilian semiarid northeast is undergoing a demographic transition. Comparing the 2000 and 2010 census date, the proportion of young people in the total population decreased from 33% to 26.5%, while the population over 60 increased from 8.4% to 10.3%. Youth exodus to urban areas intensifies the aging of the rural population as the largest migrant group is the population ranging from 16 to 35 years of age. Brazil's Youth Statute (2013) defines youth as individuals between 15-29 years. According to the Brazilian Institute of Geography and Statistics (IBGE), one in four Brazilians living in the countryside are considered to be extremely poor, i.e. 25.5% or 4.1 million people, of which 51% are young people (IBGE, 2010). In North and Northeast regions 1.5 million rural young people experience situations of extreme poverty, which is equivalent to 34.88% of all young people living in rural Brazil. In a survey conducted by UNICEF (2014), it was diagnosed that the majority of rural youth in Brazil (45.5%) had not completed elementary school, 37.8% were in high school and 1.6% had reached university.

The Northeast Semiarid concentrates the majority of Brazilian teenagers living in poverty - 67.4%. For children and youth, the living, educational, and employment conditions are dire. 21.4% of children and teenagers (5 - 17 years old) living in the Northeast region have poor or no access to quality water and sanitation, 25.7% have extreme deprivation of education rights (i.e. are out of school), and 7.3% of are subject to child labor. These conditions lead to the migration patterns described above. The Brazilian rural Northeast does not offer enticing employment opportunities, as it combines low income generation capacity, harsh working conditions, and lack of basic services. Specific youth groups that are even more disadvantaged, include young women, indigenous youth and those from traditional

communities. Nevertheless, there is a trend of young family farm members who have received a higher education and return as extension workers and engaged in other services, suggesting that a more technical approach to farming and more stable employment conditions may retain youth in the region. The region recently has also been the focus of major foreign investments in renewable energies such as wind and solar power opening an opportunity window.

National policies, strategies and actors

Main rural development policies and strategies	
Name	Issues related to youth
Brasil Sem Miséria	
Brazilian National Policy on Climate Change	
Youth-specific policies and strategies	
Statute of Youth (2013)	
Actors engaging in youth-issues	
Federal - Secretaria Nacional da Juventude	

Pathways

Youth play a key role in tackling climate change, PCRP will therefore take a youth inclusive approach that focuses on the economic, political, economic and cultural causes of vulnerability of different groups. It will support their early adoption of new technologies and approaches that can boost more sustainable agriculture, make sure their voices are heard and empower them as agents of change.

Aim	To increase PCR's impact on the social and economic empowerment of youth in the semiarid region of Northeast Brazil	
Outreach	At least 50 percent of the beneficiaries will be young people	
Objectives	Economic empowerment	Decision-making and representation
Activities	<ul style="list-style-type: none"> - Access to CRPS technologies and approaches that attract young people and finance and strengthened links with profitable markets - Creating new income opportunities for youth emerging from the sustainable management of the Caatinga (seeds, nuts, fruits, forage, etc.) and bio saline agriculture, and support for micro-enterprises to supply small-scale equipment for CRPS - Teaching and experimenting with CRSP in schools - Short-term professional courses with a focus on diversity of production systems and CRPS 	<ul style="list-style-type: none"> - Ensure involvement of youth in the development and implementation of Territorial Resilience Investment Plans - Ensure involvement of youth in collective areas sustainable management - Leadership training for youth - Development of a young communicators network
M&E	Age-disaggregated indicators	

Targeted sub-groups

Youth in general constitute a main target group of PCR, with at least 50 percent of all beneficiaries being between 15 and 29 years old. Nevertheless, there are a number of sub-groups that given their vulnerability will be specifically targeted:

- *Young people living in rural areas who have no education or only basic education:* These young women and men will be trained in CRPS principles and practices. They will also be targeted to benefit from productive investments in CRPS.
- *Young entrepreneurs:* They will be supported technically and financially in setting up or expanding enterprises that provide services or products for improving family farmers' CRPS. In addition, new income opportunities for youth will emerge from the sustainable management of the Caatinga (seeds, nuts, fruits, etc.) and bio saline agriculture. Young people will be supported in taking advantage of these new opportunities and setting up their businesses.
- *School going youth:* By implementing CRPS in schools, the interest and employability of youth attending rural schools will be increased. Students will be taught about CRSP and have to opportunity to experiment with it.

Special attention will be given to young women (see gender strategy) and those coming from indigenous and traditional communities. Disaggregated data will be collected to monitor their engagement in the project and take corrective measures if necessary.

Implementation arrangements

The following provisions have been taken to ensure the youth-inclusiveness of project management:

- Development of a project youth strategy
- Setting of targets for youth as a percentage of beneficiaries
- Allocation of budget for specific youth-related activities
- Recruitment of a full-time youth and social inclusion specialist in the project management team (to oversee the implementation of the youth strategy, provide staff capacity building, and support colleagues in addressing youth inclusion considerations into their operations, including knowledge management, M&E indicators and results measurement)
- Age-disaggregated data will be collected and analysed
- Studies undertaken by the project will include an age perspective

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex 9: Integrated Project Risk Matrix (IPRM)

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

Overall Summary

Risk Category / Subcategory	Inherent risk	Residual risk
Country Context	Substantial	Moderate
<i>Political Commitment</i>	<i>Substantial</i>	<i>Moderate</i>
<i>Governance</i>	<i>Moderate</i>	<i>Moderate</i>
<i>Macroeconomic</i>	<i>Substantial</i>	<i>Moderate</i>
<i>Fragility and Security</i>	<i>Substantial</i>	<i>Moderate</i>
Sector Strategies and Policies	Substantial	Moderate
<i>Policy alignment</i>	<i>Substantial</i>	<i>Moderate</i>
<i>Policy Development and Implementation</i>	<i>Substantial</i>	<i>Moderate</i>
Environment and Climate Context	Substantial	Moderate
<i>Project vulnerability to environmental conditions</i>	<i>Substantial</i>	<i>Moderate</i>
<i>Project vulnerability to climate change impacts</i>	<i>Substantial</i>	<i>Moderate</i>
Project Scope	Moderate	Moderate
<i>Project Relevance</i>	<i>Moderate</i>	<i>Moderate</i>
<i>Technical Soundness</i>	<i>Moderate</i>	<i>Moderate</i>
Institutional Capacity for Implementation and Sustainability	Moderate	Moderate
<i>Implementation Arrangements</i>	<i>Moderate</i>	<i>Moderate</i>
<i>Monitoring and Evaluation Arrangements</i>	<i>Moderate</i>	<i>Moderate</i>
Financial Management	Substantial	Moderate
<i>Organization and Staffing</i>	<i>Substantial</i>	<i>Moderate</i>
<i>Budgeting</i>	<i>Low</i>	<i>Low</i>
<i>Funds Flow/Disbursement Arrangements</i>	<i>High</i>	<i>Substantial</i>
<i>Internal Controls</i>	<i>Substantial</i>	<i>Moderate</i>
<i>Accounting and financial reporting</i>	<i>Substantial</i>	<i>Moderate</i>
<i>External Audit</i>	<i>Low</i>	<i>Low</i>
Project Procurement	Moderate	Low
<i>Legal and Regulatory Framework</i>	<i>Moderate</i>	<i>Low</i>
<i>Accountability and Transparency</i>	<i>Substantial</i>	<i>Moderate</i>
<i>Capability in Public Procurement</i>	<i>Moderate</i>	<i>Low</i>
<i>Public Procurement Processes</i>	<i>Low</i>	<i>Low</i>
Environment, Social and Climate Impact	Moderate	Low
<i>Biodiversity Conservation</i>		<i>No risk envisaged</i>
<i>Resource Efficiency and Pollution Prevention</i>		<i>No risk envisaged</i>
<i>Cultural Heritage</i>		<i>No risk envisaged</i>
<i>Indigenous People</i>	<i>Moderate</i>	<i>Low</i>

Risk Category / Subcategory	Inherent risk	Residual risk
<i>Labour and Working Conditions</i>	<i>Moderate</i>	<i>Low</i>
<i>Community Health and Safety</i>	<i>Moderate</i>	<i>Low</i>
<i>Physical and Economic Resettlement</i>		<i>No risk envisaged</i>
<i>Greenhouse Gas Emissions</i>		<i>No risk envisaged</i>
<i>Vulnerability of target populations and ecosystems to climate variability and hazards</i>		<i>No risk envisaged</i>
Stakeholders	Moderate	Moderate
<i>Stakeholder Engagement/Coordination</i>	<i>Moderate</i>	<i>Moderate</i>
<i>Stakeholder Grievances</i>	<i>Moderate</i>	<i>Moderate</i>
Overall	Moderate	Moderate

Country Context	Substantial	Moderate
Political Commitment	Substantial	Moderate
Risk: The risk that a country's political developments result in delays or the potential reversal of key political decisions and commitments (including approval and implementation of laws and regulations, and timely counterpart funding) that underpin the project's success. This includes upcoming elections, impending changes in government, high political instability/turnover/uncertainty, and/or changing political priorities.	Substantial	Moderate
Mitigations: Misalignments between state governments and the Federal Government could lead to implementation problems. This will be mitigated by having the design documentation thoroughly discussed at both state and federal levels through consultations and dialogue by IFAD Hub in Brasilia mainly with federal partners, and IFAD Satellite Office in Salvador, mainly with subnational entities (states), as well as various partners and stakeholders such as civil society, farmers' organizations, research organizations, among others. Stakeholder consultations will be carried out and constant dialogue with states ensured by collaboration with the Forum of State Secretaries and Northeast Consortium of Governors. The partnership with BNDES, a national government body directly tied to the Ministry of Economy, mitigates this risk, assuring dialogue between federal and state levels. IFAD Salvador office will continue its strong dialogue with BNDES. In addition, collaboration and dialogue will continue with other federal partners mainly Ministry of Agriculture (MAPA), Ministry of Citizenship and Ministry of Environment (MMA) as well as other federal agencies such as CODEVASF and EMBRAPA. Mitigation will also ensure cooperation with federal universities and think-tanks such as UNB and UFV.		
Governance	Moderate	Moderate

Risk: The risk that the country exhibits governance failures that may undermine project implementation and achievement of project development objectives. This includes lack of or weak: political checks and balances; public auditing systems; transparent information on government rules, regulations, and decisions; standards to prevent fraud and corruption; quality and transparency of allocation of resources for rural development.	Moderate	Moderate
Mitigations: This risk will be mitigated by strong implementation support and supervision missions by IFAD as well as acquired capacities from previous IFAD projects in the country. IFAD capacity building and training on fiduciary aspects will also be critical. IFAD missions will ensure to include fiduciary experts in the area of financial management and procurement.		
Macroeconomic	Substantial	Moderate
Risk: The risk that macroeconomic policies, such as monetary, fiscal, debt management/sustainability, and trade policies are not robust, are unsustainable, and/or are vulnerable to domestic or external shocks (e.g. resulting in high inflation, low foreign exchange reserves, large fiscal deficits, debt distress), undermining government capacity to mobilize counterpart funding, and significantly impacting market dynamics of value chains, including market prices and profit margins for project target groups.	Substantial	Moderate
Mitigations: Borrowing ability: Northeast states would need to have a qualified domestic debt rating to have a loan agreement with BNDES. Ratings are provided by BNDES. Only states with credit ratings will qualify. The flexible approach adopted by the project of selecting states at the time of project implementation reduces significantly the risk of not having enough states that qualify among the nine northeastern states. On the other hand, fiscal strain on states due to factors such as COVID can lead to a reduced number of states which will qualify and this needs to be monitored constantly. In addition, states need to continue to demonstrate appetite and commitment for the project. IFAD constant dialogue with BNDES as well as with states will be essential especially during the phase of state selection.		
Fragility and Security	Substantial	Moderate
Risk: The risk that the country is vulnerable to natural and man-made shocks including civil unrest, conflict, and/or weak governance structures and institutions.	Substantial	Moderate

Mitigations: The main risks of this nature are related to climatic shocks such as severe droughts and the nature of the project is exactly to build resilience and better conditions to face climatic shocks. Another risk pertains to criminality or drug trafficking in the project area which may impair implementation. This will be mitigated by technical assistance (TA) teams and continuing monitoring of the situation with the support partners, states and UNDSS.		
Sector Strategies and Policies	Substantial	Moderate
Policy alignment	Substantial	Moderate
Risk: The risk that a country's strategies and policies governing the rural and agricultural sector are not sufficiently pro-poor and/or aligned with IFAD priorities (e.g. on land, environment, climate, gender, indigenous peoples, nutrition, youth, private sector engagement), undermining project implementation and the achievement of project development objectives.	Substantial	Moderate
Mitigations: There is a risk that the national government changes its policies (especially towards climate change) which would result in a misalignment with the project's strategies and objectives. At state level, where the project will be implemented, this risk is much lower. The partnership with BNDES, a national government body directly tied to the Ministry of Economy, mitigates this risk, assuring dialogue between federal and state levels. In addition, PCRP will institute an Advisory Committee in the governance to promote the integration and alignment with other government projects, programs and policies. It shall be composed of representatives from the federal government, civil society, states, BNDES, and NDA.		
Policy Development and Implementation	Substantial	Moderate
Risk: The risk that the country's strategies and policies governing the rural and agricultural sector lack a sound evidence base, are not representative of rural peoples' organizations views, are not adequately resourced or supported by legal/regulatory frameworks, and/or are unsustainable, undermining project implementation and the achievement of project development objectives	Substantial	Moderate

Mitigations: The project will build collaboration with research organizations as well as with think tanks so as to have appropriate views on data and information and in order to guide the project implementation. In addition, the DAKI grant which will pave the way for the PCRPP implementation will also ensure to have check and balances on the country's and state's policies and strategies for rural development and climate. The project will also establish an Advisory Committee in its governance structure to promote the integration and alignment with other government projects, programs and policies. It shall be composed of representatives from the federal government, civil society, states, BNDES, and NDA. The Advisory Committee will also serve as a platform for the discussion of policies and strategies. In addition, IFAD will continue its strong engagement during project implementation with key stakeholders such as farmers' organizations and civil society.		
Environment and Climate Context	Substantial	Moderate
<i>Project vulnerability to environmental conditions</i>	<i>Substantial</i>	<i>Moderate</i>
Risk: The risk that existing or possible future environmental conditions or extreme events (e.g. earthquake, volcano eruption, land erosion, salinity, siltation etc.) may have significant adverse impacts on food and nutrition security, agricultural productivity, access to markets, value chains, infrastructure, and/or the incidence of pests and diseases, resulting in increased vulnerability or deterioration of target populations' livelihoods and ecosystems. Inherent environmental risks for agriculture in NE Brazil are drought, increased water salinity, erosion, and land degradation.	Substantial	Moderate
Mitigations: Extreme environment conditions pose a real risk but the PCRPP is designed to build resilience of communities and improve their agricultural practices to better face such conditions. The main risk pertains to prolonged drought, which would be critical especially in the first years when the CRPS are more vulnerable. To mitigate this risk, water harvesting and storage systems will be implemented simultaneously in conjunction with some CRPS. In addition, it would be possible to accelerate the implementation of practices based on the management of herds in an emergency and with the use of local natural resources. To address the issues of land degradation, erosion, and salinity, the project will implement agricultural best practices that result in enhanced water management and water retention in soils, as well as agroforestry practices that increase the quality of soils.		
<i>Project vulnerability to climate change impacts</i>	<i>Substantial</i>	<i>Moderate</i>
Risk: The risk that existing or possible future climate variability and/or extreme climatic events may have significant adverse impacts on food and nutrition security, agricultural productivity, access to markets, value chains, infrastructure, and/or the incidence of pests and diseases, resulting in increased vulnerability or deterioration of target populations' livelihoods and ecosystems. In the Brazilian semi arid, temperature increase and rainfall variability are the most relevant climate change impacts.	Substantial	Moderate

Mitigations: Climate change is having a significant impact in the Brazilian semi-arid, hence the PCRCP is designed to address this risk by building resilience of communities to better face such conditions. The main risk pertains to prolonged drought, which could directly affect food supply, nutrition productivity and marketing. In this regard, the project is focused on implementing Climate Resilient Productive Systems (CPRS) that are designed to increase water retention and improve the quality of agricultural soils. The project will provide strong technical assistance to deliver training and capacity building of beneficiaries as well as implement small-scale water harvesting technologies. The adoption of CRPS will also ensure that food availability and nutrition standards are maintained even during climatic shocks.		
Project Scope	Moderate	Moderate
Project Relevance	Moderate	Moderate
Risk: The risk that the objectives and interventions of the project are not well aligned with national development or IFAD priorities, and/or are not sufficiently relevant or responsive to the needs and priorities of the intended target group throughout the project's lifespan.	Moderate	Moderate
Mitigations: In order to ensure project relevance, the design was carried out with strong consultations at various levels. Considering that before IFAD design the GCF Funding Proposal had to be elaborated this meant the project had a very intense preparation and field consultation. At the federal level, the Project will develop strategic partnerships with the ministries responsible for the corresponding thematic areas. A public consultation was organized during the project design phase bringing together more than 120 representatives from government, civil society organizations, public and private institutions. On this occasion, it was possible to collect recommendations and suggestions that were incorporated into the project design. Another specific indigenous consultation was also held. In addition, IFAD made consultations with states directly and through the Northeast Consortium of Governors (Consórcio Nordeste) and the Forum of State Secretaries of Northeast, which is a policy dialogue platform supported by IFAD since 2015. The Consortium visited IFAD HQ in November 2019. Two field missions were conducted, one in Bahia state and another in Pernambuco state, ensuring that views of farmers' organizations were taken into account.		
Technical Soundness	Moderate	Moderate
Risk: The risk that technical design factors, such as over-complexity, over/insufficient-ambition or innovativeness, inadequate incorporation of lessons learned and best practices, weak economic, social inclusion and environmental sustainability rationale, weak analytic underpinnings (including because such may not be available), or overly rigid design, may undermine project implementation and achievement of project development objectives.	Moderate	Moderate

<p>Mitigations:</p> <p>The project represents an innovative approach to IFAD work in Brazil by establishing partnership with BNDES and a multi-state loan operation. It will also promote several technical innovations, in particular in CRPS to be implemented in Component 1. There is a risk that the proposed techniques will not be implemented correctly, as there are few examples of CRPS in the semiarid in family farms. This could create a delay in project implementation and/or achievement of results. To mitigate this risk, the following measures were put in place: i) The Dryland Adaptation Knowledge Initiative (DAKI) grant, approved in December 2019, will consolidate knowledge and methodology regarding the innovations of Components 1 and 2, and train potential TA personnel. In addition, the ongoing AKSAAM grant will also support in bridging this knowledge gap; ii) TA will be composed of specialists who know the intervention regions and have gained knowledge from DAKI and AKSAAM; and iii) farmers networks will allow participation of larger size farmers that implement CRPS promoting exchanges visits to share practices and innovations.</p>		
<p>Institutional Capacity for Implementation and Sustainability</p>	<p>Moderate</p>	<p>Moderate</p>
<p>Implementation Arrangements</p>	<p>Moderate</p>	<p>Moderate</p>
<p>Risk:</p> <p>The risk that the project executing agency does not have adequate resources, processes and/or systems to manage the project effectively (in accordance with the Financing Agreement and all relevant IFAD basic legal documents) towards achievement of envisaged project development objectives. This includes the project executing agency's lack of experience with IFAD (or other multilateral development bank) projects/procedures and lack of capacity to coordinate/support implementation arrangements that may involve several government agencies, different levels of government (or non-government entities), or multiple donor/financing agencies with different procedures and/or reporting requirements.</p>	<p>Moderate</p>	<p>Moderate</p>

<p>Mitigations:</p> <p>There is a risk of project delays, mainly in the first and second years, for four reasons: i) the process of preparing, negotiating and signing of sub-loan agreements between BNDES and selected states; ii) absence of complete teams in the state-level Project Management Units (PMU) and lack of knowledge of the project's operative functioning by these teams; iii) turnover of key personnel, implementing agencies and governments; and iv) poor coordination among agencies.</p> <p>Delays in the on-lending process from BNDES to the states can be mitigated by an agile and transparent selection process and preparation of a standard financing agreement that would require negotiation mainly of the financing amounts for each state.</p> <p>The selection of a key team of consultants should follow IFAD's guidelines on qualifications and the contractual arrangements IFAD allows, such as time contracts for consultant activities with monthly, measurable and reliable payments. The turnover of key project personnel can be considered of low risk when mitigated by an appropriate selection of professionals with training and experience, as well as by ensuring fair and reliable remuneration for performed activities. Priority will be awarded for states which have had past IFAD projects and are experienced in setting up PMU and TA teams.</p> <p>The use of several state-level PMUs (approximately 3) is a high risk for project execution because, in general, their regulations conflict with specific aspects of the activities necessary for efficient and transparent services. As a mitigation strategy, PMUs should be strengthened to carry out direct execution, empowering teams with specific training conducted by IFAD with the participation of state attorneys and representatives of interested parties. In the adoption of the Executing Entity, it is essential to ensure compliance with IFAD and BNDES guidelines in the contracts and provide specific training to support implementation. In case of states with previous experience of IFAD operations this will be greatly facilitated.</p> <p>In addition, the financing scheme involves IFAD, GCF, BNDES and states augmenting complexity of the operation. Institutional capacity risk will also be mitigated by strong IFAD supervision and implementation support missions ensuring that it is covered by technical aspects as well as institutional and fiduciary areas and involving capacity building and training.</p>		
<p>Monitoring and Evaluation Arrangements</p>	<p>Moderate</p>	<p>Moderate</p>
<p>Risk:</p> <p>The risk that the project executing agency's M&E processes and systems are weak or inefficient, resulting in a limited ability to monitor, validate, analyse and communicate results, capture lessons, and adjust implementation to seize opportunities and take corrective actions in a timely manner.</p>	<p>Moderate</p>	<p>Moderate</p>

Mitigations: IFAD over recent years has invested in building M&A capacity in the country, especially on its ongoing portfolio. This will leave a major legacy which will mitigate the M&E risk. Through the grant Programa Semear Internacional (PSI), IFAD first country M&E system was established in Brazil: DATA.FIDA which is currently being adopted by the ongoing portfolio and will be used by the PCR. In addition, IFAD and its project has gained expertise on critical areas related to M&E including base line surveys, MTR surveys, impact studies as well as project results survey conducted remotely. All this experience and capacity will be used to minimize M&E risk.		
Financial Management	Substantial	Moderate
Organization and Staffing	Substantial	Moderate
Risk: State-level PMUs may not have sufficient capacity, experience, and systems to comply with IFAD FM requirements.	Substantial	Moderate
Mitigations: Mitigation measures: (i) IFAD to perform FM assessments to the PMUs/ involved institutions to identify weaknesses and required improvement actions; and (ii) PMUs to build upon the pre-existing operational structure of IFAD-supported projects. Other mitigation measures: BNDES should provide professional personnel for financial management before the project effectiveness and, during project execution, should maintain this trained personnel working following IFAD's FM, Audit and Anti-Corruption Guidelines and with the Project Implementation Manual. BNDES will ensure that its key personnel conduct IFAD's online capacity building training on Financial Management. Both IFAD and BNDES' procedures and regulations will be shared to the states/subprojects through the PIM or other relevant documents. Supervision of the project's financial management will be carried out annually by IFAD, CPMU and PMUs.		
Budgeting	Low	Low
Risk: No risk envisaged	Low	Low
Mitigations: No risk envisaged		
Funds Flow/Disbursement Arrangements	High	Substantial

Risk: The complexity of the project's funds structure may pose challenges to the flow of funds. Several entities (IFAD, GCF, BNDES, and the states) will fund the project through different financing instruments ruled by separate legal agreements. Participating entities will have to prepare, negotiate and sign the legal agreements, a process that is unlikely to complete simultaneously, risking funds not being available from the different sources as needed. Additionally, legal agreements relating to the GCF may prove to be particularly complex to negotiate, leading to the risk of disbursement delays.	High	Substantial
Mitigations: Mitigating measures: IFAD will have to make extra efforts (internally from various divisions and externally with authorities) to ensure that legal agreements are prepared, negotiated, and signed timely.		
Internal Controls	Substantial	Moderate
Risk: Internal controls may be affected as per items described in the section Organization and Staffing above.	Substantial	Moderate
Mitigations: Please refer to the mitigating measures in the section Organization and Staffing above.		
Accounting and financial reporting	Substantial	Moderate
Risk: (1) GCF financial reporting and disbursement requirements are more complex or at least require a higher level of detail. This could adversely affect the disbursement process or even compromise the eligibility of expenditures. (2) The project will be implemented in a number of states and it may be challenging to ensure that accounting records are adequately and coherently maintained in all locations, and that consolidated financial reports are generated as needed.	Substantial	Moderate
Mitigations: (1) Mitigating measures: IFAD to agree on feasible requirements in the Funding Activity Agreement with the GCF, and ensure that the project will have the necessary accounting system and chart of accounts to report as needed. (2) The project should implement a common accounting system and chart of accounts to ensure consistency in accounting records and the possibility to centrally generate all needed financial reports.		
External Audit	Low	Low
Risk: No risk envisaged	Low	Low

Mitigations: No risk envisaged		
Project Procurement	Moderate	Low
Legal and Regulatory Framework	Moderate	Low
Risk: The risk that the Borrower's regulatory and institutional capacity and practices (including compliance with the laws) are inadequate to conduct the procurement in a manner that optimizes value for money with integrity.	Moderate	Low
Mitigations: Non-compliance with legal covenants will be mitigated by strong IFAD supervision and implementation support missions as well as trainings and capacity buildings to the CPMU and PMU at state level.		
Accountability and Transparency	Substantial	Moderate
Risk: The risk that accountability, transparency and oversight arrangements (including the handling of complaints regarding, for example, SH/SEA and fraud and corruption) are inadequate to safeguard the integrity of project procurement and contract execution, leading to the unintended use of funds, misprocurement, SH/SEA, and/or execution of project procurements outside of the required time, cost and quality requirements.	Substantial	Moderate
Mitigations: IFAD will ensure that this risk is mitigated by making available channels to handle complains. Transparency and accountability arrangements will be ensured with IFAD supervisions. Implementation of the project outside of required timeline or quality and cost requirement will be mitigated with IFAD support missions and adequate training.		
Capability in Public Procurement	Moderate	Low
Risk: The risk that the implementing agency does not have sound processes, procedures, systems and personnel in place for the administration, supervision and management of contracts resulting in adverse impacts to the development outcomes of the project.	Moderate	Low

Mitigations: State-level PMUs need to expedite the hiring of procurement, contract, monitoring, and financial teams as soon as the project execution starts. Once projects become effective, IFAD and BNDES should receive the names of team members (state employees), the Terms of Reference (TOR) to hire supporting consultants and should train teams in the required thematic areas. The PIM (Annex 8) includes draft TORs of the key positions to speed contracting processes. Priority may be awarded for states which have past IFAD projects and are experienced in setting up PMU and TA teams and which already have experience with procurement.		
Public Procurement Processes	Low	Low
Risk: The risk that procurement processes and market structures (methods, planning, bidding, contract award and contract management) are inefficient and/or anti-competitive, resulting in the misuse of project funds or sub-optimal implementation of the project and achievement of its objectives.	Low	Low
Mitigations: IFAD will mitigate public procurement processes risks with strong supervision and implementation support as well as ensuring the audits are made timely.		
Environment, Social and Climate Impact	Moderate	Low
Biodiversity Conservation		No risk envisaged
The PCRPP acts to build resilience of communities as well as build biodiversity and enhanced diversified nutritious food.		
Resource Efficiency and Pollution Prevention		No risk envisaged
The PCRPP will adopt technologies leading to less pollution and reuse of resources such as reuse of grey water. All technologies financed by the project will be renewable (solar or wind power, for example).		
Cultural Heritage		No risk envisaged
The project will not work in any new land, only in lands that are already being used for agriculture.		
Indigenous People	Moderate	Low
Risk: The risk that the project may cause significant adverse physical, social, or economic impacts on indigenous peoples, or in threats to or the loss of resources of historical or cultural significance to them.	Moderate	Low

Mitigations: This risk has been mitigated at project design with a dedicated consultation with indigenous peoples. During implementation, as a first activity, the project will discuss and agree with each community on the Free Prior and Informed Consent (FPIC) process to be followed in the development of a TRIP.		
Labour and Working Conditions	Moderate	Low
Risk: The risk that the project may cause exploitative labour practices (e.g. forced or child labour), gender based violence, discriminatory and unsafe/unhealthy working conditions for people employed to work specifically in relation to the project, including third parties and primary suppliers.	Moderate	Low
Mitigations: The project and especially its technical assistance (TA) teams will be selected taken fully into account issues related to labour and working conditions and it is planned that this will be part of their curricula in terms of capacity building. The project in fact will lead to enhance conditions and awareness in the area of labour and working conditions.		
Community Health and Safety	Moderate	Low
Risk: The risk that the project may cause significant adverse impacts on the physical, mental, nutritional or social health/safety status of an individual, group, or population, including as a result of gender based violence. In particular, given the COVI-19 pandemic, there is a risk that the project TA could be a source of contagion.	Moderate	Low
Mitigations: The COVID-19 epidemic may pose a risk to the project operations and to the health of the technical assistance (TA) teams and beneficiaries. To mitigate the risk, all TA teams will follow social distancing, health and safety protocols and will wear protective gear. In addition, they will provide guidance on basic hygiene practices. Online groups will reduce all unneeded physical interaction. If a vaccine is developed and available during project implementation, IFAD can coordinate with local health authorities to promote vaccination of the beneficiaries. Pilot IFAD experiences with remote TA and services will be reviewed and utilized during the project implementation. A specific Working Paper is included on the issue of COVID-19 and its relations to the PCRP.		
Physical and Economic Resettlement		No risk envisaged
The project has very strong targeting and will enhance physical, social, cultural and/or economic impacts, especially for marginalized groups.		
Greenhouse Gas Emissions		No risk envisaged

The project will have a very positive and significant mitigation effect: the accumulated GHG mitigation potential of implementation of activities in Component 1 amounts to -6.7 tCO ₂ eq per hectare per year, or about -11 million tCO ₂ eq over the entire 20-years-period of analysis.		
<i>Vulnerability of target populations and ecosystems to climate variability and hazards</i>		<i>No risk envisaged</i>
The project will decrease beneficiaries exposure or vulnerability.		
Stakeholders	Moderate	Moderate
<i>Stakeholder Engagement/Coordination</i>	<i>Moderate</i>	<i>Moderate</i>
Risk: The risk that relevant stakeholders are not identified, and/or of inadequate/insufficient information disclosure, consultation/coordination with and buy-in from stakeholders on project objectives, delivery of interventions and promotion of sound environmental and social practices (e.g. with government, project target groups, civil society organizations, implementing partners, private sector, including financial intermediaries), resulting in misunderstandings or opposition by stakeholders, or duplication/inconsistencies between partners working in the same target area that may undermine project implementation and achievement of project development objectives.	Moderate	Moderate
Mitigations: Lack of interest among potential beneficiaries due to little awareness of CRPS, fiduciary risks and financial guarantee may be a risk for project implementation. Field visits have shown that farming families are generally aware of the problems they endure in producing during a crisis, such as the severe droughts of recent years. They are interested in finding solutions to their various problems, starting with those related to agricultural production. An ample stakeholder consultation was performed during project design to make sure the needs of the families were adequately addressed in the project. In addition, TRIPs will be developed with the participation of the beneficiary communities. An FPIC plan will be implemented for Indigenous and Traditional Communities. And youth participation will be encouraged (at least 50%), since they are more open to experimenting with new practices. For some families, the poverty condition may be an obstacle to their full participation in project activities. Some men feel threatened by women's empowerment and may not allow their wives to participate. The project will address this by working with the family's immediate needs, such as food security, nutrition and health. The design was highly participatory and reflects the demands and needs of stakeholders.		
<i>Stakeholder Grievances</i>	<i>Moderate</i>	<i>Moderate</i>

<p>Risk:</p> <p>The risk that the project has ineffective grievance/complaint redress processes (including with respect to allegations of non-compliance with IFAD's E,S,C standards, fraud, corruption, or SEA), leading to unaddressed stakeholder complaints that may undermine project implementation and achievement of project development objectives.</p>	<p>Moderate</p>	<p>Moderate</p>
<p>Mitigations:</p> <p>The project will sensitise stakeholders on the possibilities of grievance and complaint mechanisms. It will also include such information as part of IFAD missions as well as of technical assistance teams capacity building of beneficiaries.</p>		

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Annex 10: Exit Strategy

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Project No. 2000002253
Report No. 5402-BR

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There are several elements built into the design of the project that will contribute to the sustainability of project outcomes after the end of the project and form the basis for the exit strategy and up-scaling. The project is part of a series of interventions that makes up the implementation of a long-term strategy for rural areas of the Brazilian semiarid building on the extensive experiences and lessons learned from previous BNDES¹ and IFAD² projects. These are projects focused on strengthening family agriculture and climate-friendly social technologies and have over the years build a solid foundation for sustainability and up scaling of successful interventions beyond the end of each project.

The following design elements contribute to project **sustainability, durability, and scalability**:

- **Alignment with national policies and programmes.** The project is aligned with key national policies and strategies of particular relevance for the NEB such as the Brazilian National Policy on Climate Change, programs to strengthen family agriculture (such as PRONAF), the National Plan for Food and Nutrition Security, the National Policy for the Sustainable Development of Traditional Peoples and Communities, the Food Purchase Program, and Federal programmes to increase water security for the rural NEB. This ensures the basis for an enabling environment for the political and institutional support for the appreciation of successful outcomes of the project for further scaling up (see section F). During implementation, the project implementers will make efforts to keep the project aligned with any newly developing national policies and programmes.
- **Engagement of BNDES:** BNDES is a strategic partner whose commitment and experiences will add value to the entire project cycle and maximize attainment of project goals. BNDES has a national influence and capacity to mobilize resources, disseminate lessons learned to other bank programs and include the replication of CRPS in its lending portfolio.
- **Building local capacities and ownership.** The participatory diagnostic of climate change vulnerability and development of TRIPs and the subsequent investments with strong accompaniment with technical assistance support the building of family farmers' capacities to assess, plan, adopt and use climate-resilient agriculture, water and shared resources management practices. Further, the building of farmer-to-farmer exchange networks involving youth supports the local and regional upscaling.
- **Locally tailored cost-effective CRPS solutions.** CRPS shifts the way family farmers manage soil and water resources in the post-project scenario. Investments in cost-effective social technologies easy to teach, build and apply and already proven for the conditions of family farmers and communities in the NEB increases the self-reliance, sustainability and possibility for replication of the technologies beyond the project. The support for local microenterprises that produce tools, equipment and other innovations for climate-resilient production will further sustain and add value to the local solutions.
- **Voice in public policies to improve family farmers' access to markets.** Advocacy to improve access to markets and establish Environmental Reserve Quota (CRA) markets will work towards establishing a more conducive economic environment for climate resilient smallholders so that the sustainable gains are maintained beyond implementation.
- **Women and youth empowerment:** These groups' leadership is promoted across most project activities. The young communicators network, for example, engages youth to register, experiment, and build awareness of the CRPS practices. Women leadership will be fostered through the conversion of local women into knowledge managers.
- **Knowledge building by lessons learned from project implementation process:** A monitoring and evaluation (M&E) system and database will be developed in such a way that M&E can support effective implementation and upscaling. Outreach actions will use a range of methods and platforms, such as capacity-building sessions, learning, and knowledge sharing events and workshops, as well as multiple media outlets. The sharing of lessons learned fosters development effectiveness and allows implementation of CRPS system to be scaled up in existing Caatinga.

¹ BNDES's Social Fund is currently investing in family farming development programs in seven Northeast states and has already funded 24,000 cisterns and 3300 social technologies for agroecological production in the region.

² IFAD is currently implementing 6 projects supporting the productive structuring of family farming and social water-access technologies, covering 11 states, 9 of which are located in NEB.

- **Evidence-based knowledge products for policy dialogue and investment decisions.** The project implementers will use the documentation and learning from the M&E systems to produce policy briefs and other evidence based knowledge products for policy dialogues and decision makers. This will support the scaling up of intervention strategies, capacity building and investment models proven effective by the project.
- **Fostering South-South cooperation:** The project will also engage in South-South cooperation for sharing knowledge and lessons learned with farmers living under similar climate stress in other developing countries.

Exit plan. The exit strategy ultimately relies on the project's success in improving participants' livelihood and fostering an enabling environment supportive of climate-resilient agricultural production. To sustain the interventions and scaling up pathways after the end of the project, key elements need to be developed and put in place before the project closure. Learning from the good practice example from the IFAD *Viva o Semiárido, do Estado do Piauí* project, the PCRPP project team will develop an exit plan.

The objective of the exit plan is to insure that at the end of the project:

- **Family farmers and communities have capacities to continue using and further develop CRPS practices** in their fields, territories and backyard gardens, and can access quality technical assistance when needed.
- **Extension and technical assistance** providers are consolidated and able to continue supporting Family farmers and communities in adopting and further develop CRPS practices. This include farmer trainers' and young promoters' networks with continued backing from EMBRAPA and other research and extension centres and state TA teams.
- **Local created entrepreneurship businesses** are economically sustainable and can access business development advice as needed
- **Water harvesting, storage and recycling structures** are maintained and operated by family farmers, households and communities
- **Knowledge management systems** (CRPS and resilience participatory monitoring system, databases and knowledge products) will be maintained and provide quality information for policies, engagement strategies and investment and assistance programming at all levels supporting upscaling of CRPS.

Preliminary Exit plan matrix, to be up-dated and further developed annually from project start-up.

Project outputs	Responsible and role after completion	Sustainability and handover actions	Handover schedule	Funding after completion
Use and further development of CRPS practices by family farmers and communities	Family farmers and communities maintain and further develop CRPS practices providing them with resilient and stable production outcome	<p>Strengthen the capacities of farmers and communities to assess climate related risks and adaptation options and adopt and further develop CRPS practices</p> <p>All investments in adoption of CRPS practices will end 12 months before the end of the project to leave sufficient time for consolidating beneficiaries' capacities to continue and further develop CRPS practices through close follow up and technical support from State TA teams and farmer trainers and young promoters network.</p> <p>KM subproject PMU with all PMUS and Management Councils to collect data on the initial benefits generated by the investments and discuss the results with family farmers and communities.</p>	<p>Continuously</p> <p>Last project year</p> <p>Continuously with knowledge products showing performance and emerging benefits CRPS practices fed-back to farmers and communities in the last year</p>	Beneficiaries own funding

Project outputs	Responsible and role after completion	Sustainability and handover actions	Handover schedule	Funding after completion
Extension and technical assistance services	Farmer trainers' and young promoters' networks continue providing assistance and training to family farmers and communities in CRPS and water management practices with continued backing from EMBRAPA and other research and extension centres and state TA teams	<p>Discuss with farmer trainers and young promoters the needs and options for their networks to become self-sustaining including recovering small fees for their services and negotiating support from state and research institutions</p> <p>Discuss with state governments, EMBRAPA and other research institutions their continued support to the farmer trainers and young promoters networks in providing extension and TA services to family farmers and communities after the end of the project</p>	<p>Start discussions on sustainability from the beginning of the formation of the network. Implement solutions the last 12 months of the project</p> <p>Start discussions on sustainability of the provision of extension and TA services to family farmers and communities in CRPS practices after the end of the in the second project year and agree on a hand-over plan to start implementation one year before project ends</p>	<p>Different options to be agreed such as service fees and support from state and research and extension institutions</p> <p>State and research and extension institutions' budget</p>
Entrepreneurship businesses	Micro-entrepreneurs will maintain and properly manage their businesses generating income	<p>Strengthen business capacities of micro-entrepreneurs allowing them to consolidate their businesses</p> <p>All support for new micro-entrepreneurs will end 12 months before the end of the project to leave sufficient time for consolidating beneficiaries' capacities to consolidate and further develop their businesses through close follow up and technical support from State TA teams, and connecting micro-entrepreneurs in support networks.</p>	<p>Continuously</p> <p>Last project year</p>	Micro-entrepreneurs own funding

Project outputs	Responsible and role after completion	Sustainability and handover actions	Handover schedule	Funding after completion
Water harvesting, storage and recycling structures	Family farmers, households and communities to maintain and operate water infrastructures and equipment	<p>Strengthen the capacities of family farmers, households and communities including water users groups when shared infrastructures to maintain and operate the infrastructure and equipment including systematic small savings for repairs</p> <p>All investments in water infrastructure and equipment will end 12 months before the end of the project to leave sufficient time for consolidating beneficiaries' capacities for their maintenance and operation through close follow up and technical support from State TA teams and EMBRAPA and other extension and research institutions</p>	<p>Continuously</p> <p>Last project year</p>	Beneficiaries own financing (all water infrastructures and equipment are low cost and cost-efficient technologies)

Project outputs	Responsible and role after completion	Sustainability and handover actions	Handover schedule	Funding after completion
Knowledge management systems and products	CPMU, KM subproject PMU, state-based PMUs and Management Councils, will finalize, systemize, disseminate and hand-over all knowledge products and platforms to be maintained and used by local permanent, technical and knowledge institutions	<p>Preparation of project-end documentation on results and lessons learned and finalization and systematisation of knowledge products produced by the project.</p> <p>Organisation of knowledge sharing events presenting final project evidence of successful interventions, lessons learned and further developments needed and discuss up-scaling constraints and pathways with relevant stakeholders including through improved policies and strategies and technical and financial support mechanisms.</p> <p>Discuss with relevant project partners possible housing institutions and hand-over arrangement for continued operation and use of key knowledge databases, platforms and products</p> <p>Hand-over of data and responsibilities for their maintenance (e.g. of databases), use and sharing to local permanent institutions.</p> <p>Finalisation of and hand-over of knowledge products with agreed dissemination plans to technical and policy institutions for use in further up-scaling and in formulation of policies and strategies.</p>	<p>Continuously starting from the midterm review</p> <p>Continuously starting from the midterm review</p> <p>Continuously, starting from the midterm review</p> <p>Last project year</p> <p>Last project year</p>	Budget of the institutions taking over the knowledge products and platforms

Project outputs	Responsible and role after completion	Sustainability and handover actions	Handover schedule	Funding after completion
Successfully implemented Agroforestry System Investments (ISA)	Farmer organisations, to maintain and continue implementing the agroforestry systems	Strengthen the capacities of farmers and their organisations; organise ISA completion ceremonies as of which the project teams only provide M&E services, with TA responsibilities transferred to the regular extension services.	Completion ceremonies to be held after the investment: ISA Familia: 3 yrs ISA coletivo: 2 yrs ISA Escuela: 3 yrs Biosaline agriculture systems: 2 yrs Promote local entrepreneurship: 3 yrs ISA Quintais and other water investments: 2 yrs.	Participating states through the budget of the regular extension services.

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Annex 11: Mainstreaming themes – Eligibility criteria checklist

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

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Mainstreaming themes – Eligibility criteria checklist

	<input checked="" type="checkbox"/> Gender transformational	<input checked="" type="checkbox"/> Youth sensitive	<input checked="" type="checkbox"/> Nutrition sensitive	<input checked="" type="checkbox"/> Climate finance
Situation analysis	<input checked="" type="checkbox"/> National gender policies, strategies and actors <input checked="" type="checkbox"/> Gender roles and exclusion/discrimination <input checked="" type="checkbox"/> Key livelihood problems and opportunities, by gender <input checked="" type="checkbox"/> Use (pro-WEAI) assessment for M&E baseline	<input checked="" type="checkbox"/> National youth policies, strategies and actors <input checked="" type="checkbox"/> Main youth groups <input checked="" type="checkbox"/> Challenges and opportunities by youth group	<input checked="" type="checkbox"/> National nutrition policies, strategies and actors <input checked="" type="checkbox"/> Key nutrition problems and underlying causes, by group <input checked="" type="checkbox"/> Nutritionally vulnerable beneficiaries, by group	
Theory of change	<input checked="" type="checkbox"/> Gender policy objectives (empowerment, voice, workload) <input checked="" type="checkbox"/> Gender transformative pathways <input checked="" type="checkbox"/> Policy engagement on GEWE	<input checked="" type="checkbox"/> Pathways to youth socioeconomic empowerment <input checked="" type="checkbox"/> Youth employment included in project objectives/activities	<input checked="" type="checkbox"/> Nutrition pathways <input checked="" type="checkbox"/> Causal linkage between problems, outcomes and impacts	
Logframe indicators	<input checked="" type="checkbox"/> Outreach disaggregated by gender <input checked="" type="checkbox"/> Women are > 40% of outreach beneficiaries <ul style="list-style-type: none"> • Pro-WEAI indicator 	<input checked="" type="checkbox"/> Outreach disaggregated by age	<input checked="" type="checkbox"/> Outreach disaggregated by gender <ul style="list-style-type: none"> • Further details to be confirmed 	
Human and financial resources	<input checked="" type="checkbox"/> Staff with gender TORs <input checked="" type="checkbox"/> Funds for gender activities <input checked="" type="checkbox"/> Funds for Pro-WEAI surveys in M&E budget	<input checked="" type="checkbox"/> Staff with youth TORs <input checked="" type="checkbox"/> Funds for youth activities	<input checked="" type="checkbox"/> Staff or partner with nutrition TORs <input checked="" type="checkbox"/> Funds for nutrition activities	IFAD Adaptation Finance \$13,236,000 IFAD Mitigation Finance \$15,073,000 Total IFAD Climate-focused Finance \$28,309,000
ECG Remarks	<p>Gender</p> <p>Gender transformational strategy designed and validated with HQ Gender specialist</p> <p>Nutrition</p> <p>Nutrition sensitive strategy designed and validated with HQ Nutrition specialist</p> <p>Youth</p> <p>Youth sensitive strategy designed and validated with HQ Gender/Social Inclusion specialist</p> <p><input type="checkbox"/> No social inclusion themes</p>			

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Annex: Appendix 1. Working Paper 1 Feasibility Study 060420

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
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1. INTRODUCTION

This feasibility study was carried out as part of the preparation for the Planting Resilience in Rural Communities of the Brazilian Semi-arid (PCR) project. Its main goal is to promote climate resilient production systems (CRPS) within the poor rural population in the northeastern semi-arid region of the country.

The main objectives of this study are:

- i) to analyze the current situation of the Brazilian semi-arid given the future climate change scenario,
- ii) to identify and characterize the most critical problems faced by the rural poor, as well as the barriers and challenges that the situation poses;
- iii) describe the main solutions to be implemented by the PCR;
- iv) analyze these solutions and their feasibility in the productive and environmental scope;
- v) make a detailed presentation of the PCR and its various dimensions.

An extensive literature review on the topics mentioned above was undertaken, as well as field information gathering work with various local actors - research entities, rural development support organizations, multiple technicians and farmers working in the field. The PCR has the endorsement of the National Designated Authority (NDA), the Ministry of Economy, which has issued the no-objection letter and the COFIEX Resolution with the approval of the project. The project design team consulted several public agencies about the theme of resilient production systems in the region, over the following timeline:

- Field mission in Bahia State: 1 to 5 October 2018;
- Field Mission in Pernambuco State: 15 to 17 October 2018;
- Public hearing in Recife, Pernambuco: 18 October 2018;
- Main mission in Brasilia: 19 to 26 October 2018;
- BNDES HQ design mission: 18 to 22 February 2019;
- Indigenous groups consultation: 8 June 2019.

The Public Hearing in Recife was attended by over 100 people representing various stakeholders. The field missions in Bahia and Pernambuco, prepared in collaboration with many partners, have allowed the design team to study and analyze technologies, technical assistance processes, experiences and innovations, specific demand and conditions of the semi-arid region, organizational and community-based structures, and institutional arrangements while taking stock of social, environmental, economic and environmental risks.

Meetings with a staff of IFAD-financed projects in Bahia (Pro-semi-arid) and Paraiba (PROCASE) were held in July 2018 and a field visit to an agroforestry experience (Fazenda Ouro Fino in Bahia) was organized in August 2018. The consultation at the federal level also included other Ministries: Citizenship; Environment; Science and Technology; Agriculture, Livestock and Food Supply; Home Affairs, and Foreign Relations.

The IFAD also prepared a regional grant project, the Dryland Adaptation Knowledge Initiative (DAKI), which was approved by IFAD in December 2019. The project will start in the first quarter of 2020 and pave the way and prepare for the PCR.

This document presents the results of all these analyses and consultations. It begins with the discussion of the different elements of the context that characterize the issue of resilience in the face of climate change in the Brazilian Semi-arid, including relevant public policies. Then, the socioeconomic and environmental crisis in the Semi-arid and the barriers that need to overcome them are presented. In the next section, the initiatives the Project proposes to implement are described and analyzed, and the PCR activities and modus operandi are explained. The final section presents the main conclusions of this feasibility study.

2. CONTEXT ANALYSIS

2.1 Brazil's Northeast Semi-arid

The officially defined Semi-arid Region¹ (see Figure 1 below) hosts 27 million people (12% of the country's total population)² and covers 1,262 municipalities in ten States. A small part of the official Semi-arid Region (18%) of this region are in the State of Minas Gerais and Espírito Santo, while the remaining 82% is in 8 Northeastern States³. The Project area will within be the rural semi-arid part of these eight northeastern states: Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, and Bahia; where the most impoverished population lives and where IFAD has been supporting pro-poor rural development for the past 25 years. It is also the area where family farming is concentrated and currently faces the country's most significant challenge regarding poverty eradication.⁴

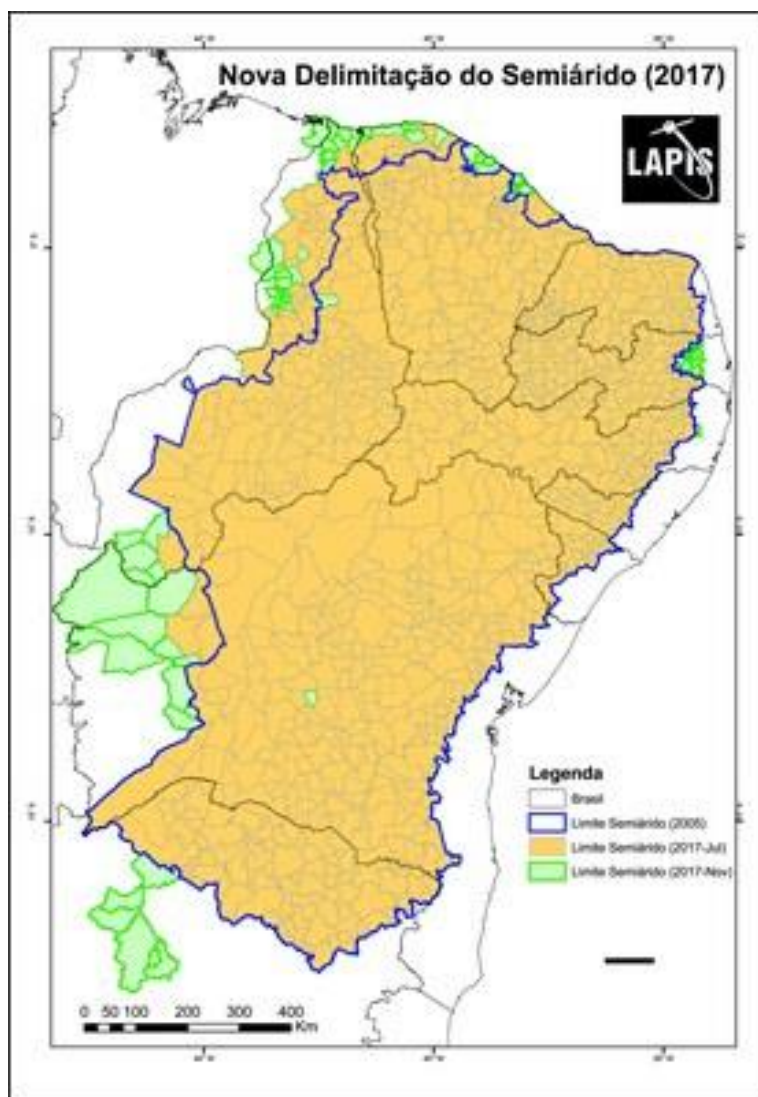


Figure 1 Map of NE Brazil, highlighting the Semi-arid region⁵

¹ The SUDENE (Superintendência de Desenvolvimento do Nordeste) Resolution 115 of 23/11/2017 defines the Semi-arid region with the following characteristics: i) Average annual rainfall of 800 mm or less; ii) Thornthwaite Aridity Index equal to or less than 0.50; and iii) Daily percentage of water deficit equal to or greater than 60%, considering all days of the year.

² Ministry of Integration webpage, available at: <http://www.integracao.gov.br/semiarido-brasileiro>.

³ These eight Northeastern States are the following: Bahia, Sergipe, Alagoas, Pernambuco, Paraíba, Rio Grande do Norte, Ceará and Piauí.

⁴ IFAD - IPC-IG. Climate change and impacts on family farming in the North and Northeast of Brazil, Working Paper No.141, Brasília, IPC-IG, UNDP, IPEA, IFAD, 2016. (This study was commissioned and paid for by IFAD).

⁵ LAPIS (Laboratório de Análise e Processamento de Imagens de Satélites) / UFAL (Universidade Federal de Alagoas), 2017. (https://al1.com.br/noticias/meio-ambiente/14137/Portal_AL1).

2.2 Historical and Current Climate Overview

2.2.1 Climate Data

The semiarid northeast of Brazil (NEB)⁶ is qualified as a tropical dry climate with average minimum and maximum temperatures between 21.23°C and 30.85 °C, respectively. This region can get much hotter during the dry season, has a short, erratic rainy season from March to May, and annual rainfall averages from 390 to 1,550 mm. The coolest months on average are June and July and the warmest is October. Lowest minimum temperatures can be found in the central area of the State of Bahia, while maximums concentrate primarily in the most northern states.

The northeast region has experienced secular chronic problems related to water scarcity, with periodic droughts. However, it is possible to identify an increase in temperature from 1901 to 2000 of about 0.8 °C in NEB and an important acceleration in warming during the last three decades. An analysis of drought events that occurred in the Semiarid from 1981 to 2016⁷ reveals that drought intensity for the last 36 years has been increasing and that recent droughts were more frequent, more severe and affected a larger area with significant impacts for population, as well as economical activities.

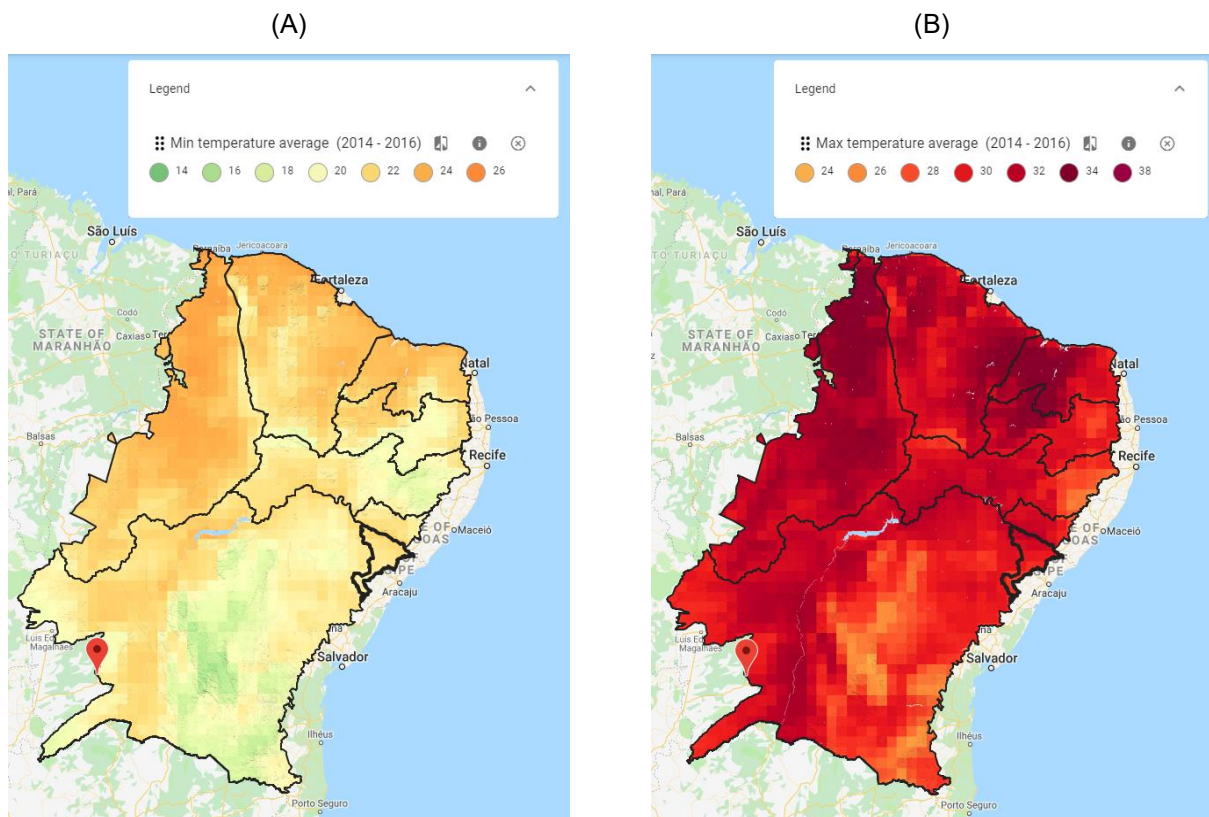


Figure 2 Min (A) and Max (B) average temperature 2014-2016

Appendix IV presents the climate profile for each of the 8 States in the Northeast.

It is possible to identify an increase in temperature from 1901 to 2000 of about 0.8 °C in NEB⁸, considering climate parameters. For Semiarid NEB between 1989 and 2016, Semiarid portion of Bahia's max temperature increased by 1.58°C up to 29.9°C; of Piauí by 2.05°C up to 32.3°C; of Ceará by 0.88°C up to 31.78°C; of Rio

⁶ The Resolution 115 of 23/11/17 from Sudene defines the Semiarid by the following characteristics: i) Average annual rainfall of 800 mm or less; ii) Thornthwaite Aridity Index equal to or less than 0.50; and iii) Daily percentage of water deficit equal to or greater than 60%, considering all days of the year.

⁷ Brito, SSB; et.al. Frequency, duration and severity of drought in the Semiarid Northeast Brazil region, International Journal of Climatology, 2017.

⁸ MARENGO, J. A.; RODRIGUES TORRES, R.; ALVES, L. M. (2016). As above.

Grande do Norte by 0.51°C up to 32.02°C; of Paraíba by 0.45°C up to 30.72°C; of Pernambuco by 0.68°C up to 30.44°C; of Alagoas by 0.70°C up to 29.63°C; and of Sergipe by 0.96°C up to 29.32°C.⁹

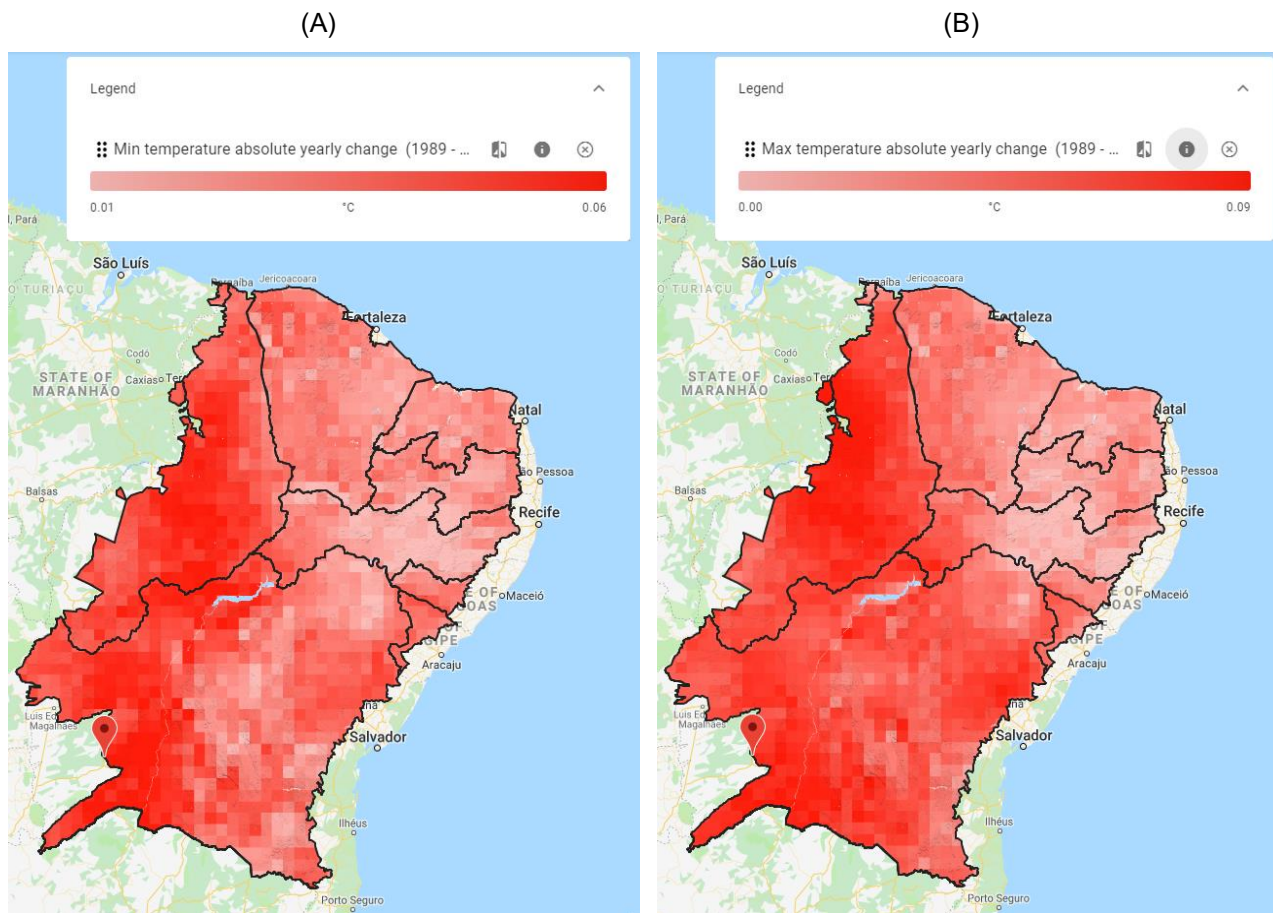


Figure 3 Min (A) and Max (B) absolute temperature yearly change 1989 – 2016¹⁰

Average annual rainfall is about 645 mm, the Semiarid NEB presents great variability in rainfall distribution with average rainfall variations ranging from 390 mm in districts like Retirolândia, Valente, and Gavião to 1,550 mm in districts like Barras, Batalha, Mucambo and Graça (Figure 4 (A)). Generally, the driest period is from June to September, with August and September presenting the lowest average rainfall. The average annual precipitation has reduced by approximately 74 mm between 1981 and 2018. During that period the Semiarid portion of Bahia's average annual rainfall decreased by 91.70 mm to 548.47 mm; of Piauí by 66.30 mm to 760.22 mm; of Ceará by 85.90 mm to 735.41 mm; of Rio Grande do Norte by 46.14 mm to 671.25 mm; of Paraíba by 4.69 mm to 693.02 mm; of Pernambuco by 57.55 mm to 570.30 mm; of Alagoas by 60.98 mm to 673.36 mm; and of Sergipe by 120.01 mm to 734.49 mm.

⁹ Important variations may occur at district level; information has been developed up to ADM2 and is presented in FAO EarthMap platform for all available data sets.

¹⁰ European Centre For Medium-Range Weather Forecasts (ECMWF), 2016.

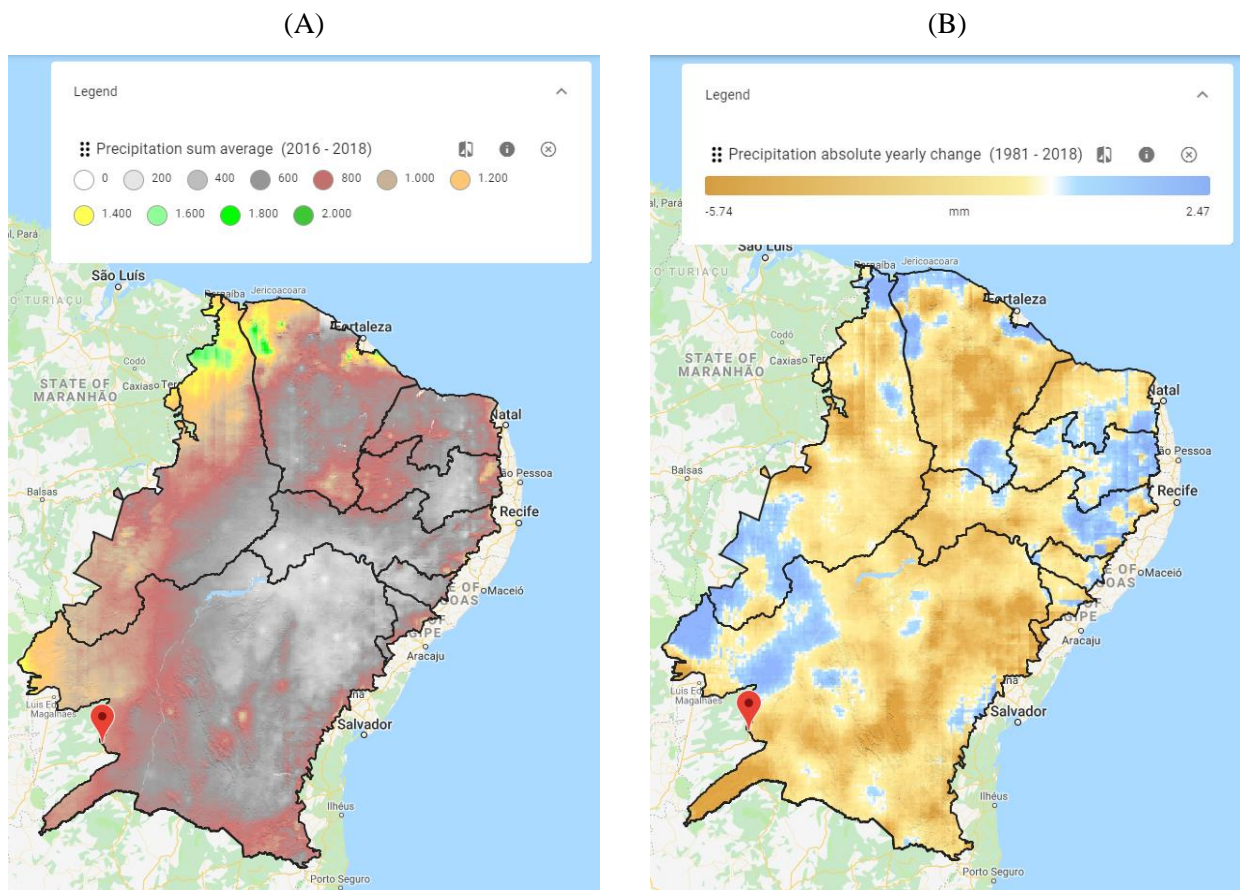


Figure 4 (A) Precipitation sum average 2016 - 2018¹¹; (B) Precipitation absolute yearly change (1981-2018)¹²

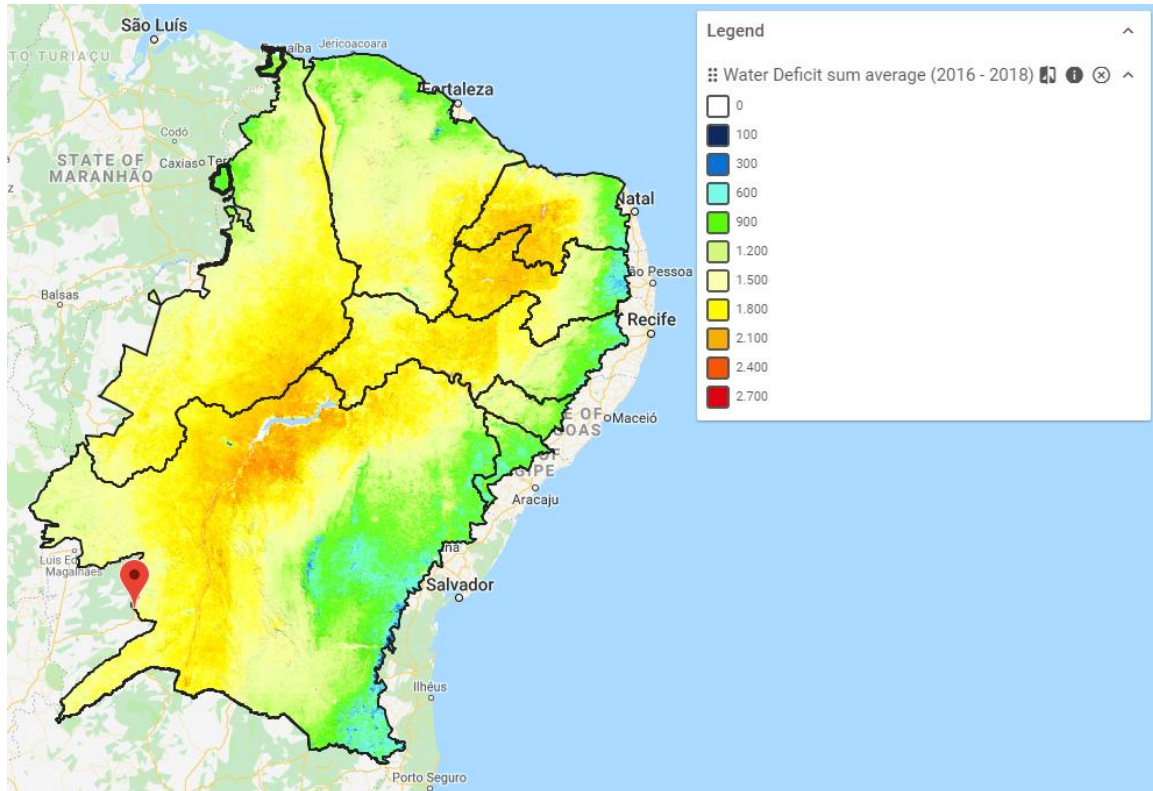


Figure 5 Climatic water deficit sum average 2016 – 2018¹³

¹¹ CHIRPS: Climate Hazards Group InfraRed Precipitation with Station data (version 2.0 final)

¹² Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS v2)

¹³ LP DAAC derived from processing MOD16A2 MODIS/Terra Net Evapotranspiration 8-Day L4 Global (500m), version 6

The region is highly affected by climatic water deficit (figure 5) deriving from high annual evaporation. The average climatic water deficit has grown from 2001 to date by 65.62 kg/m² with important peaks in 2012 and 2015 reaching a deficit of up to 1,709.33 kg/m². The areas most affected are low lying inland terrains highly vulnerable to droughts. Within Semiarid NEB (figure 6), water bodies represent less than 1% of total land cover; while the highest percentage of the territory is shrubs at approximately 36%; another 19% are dry forests, 17% is grasslands. Bahia and Piauí are the states with the highest concentration of areas suffering from annual fires, as well as the areas with most access to forest resources.¹⁴

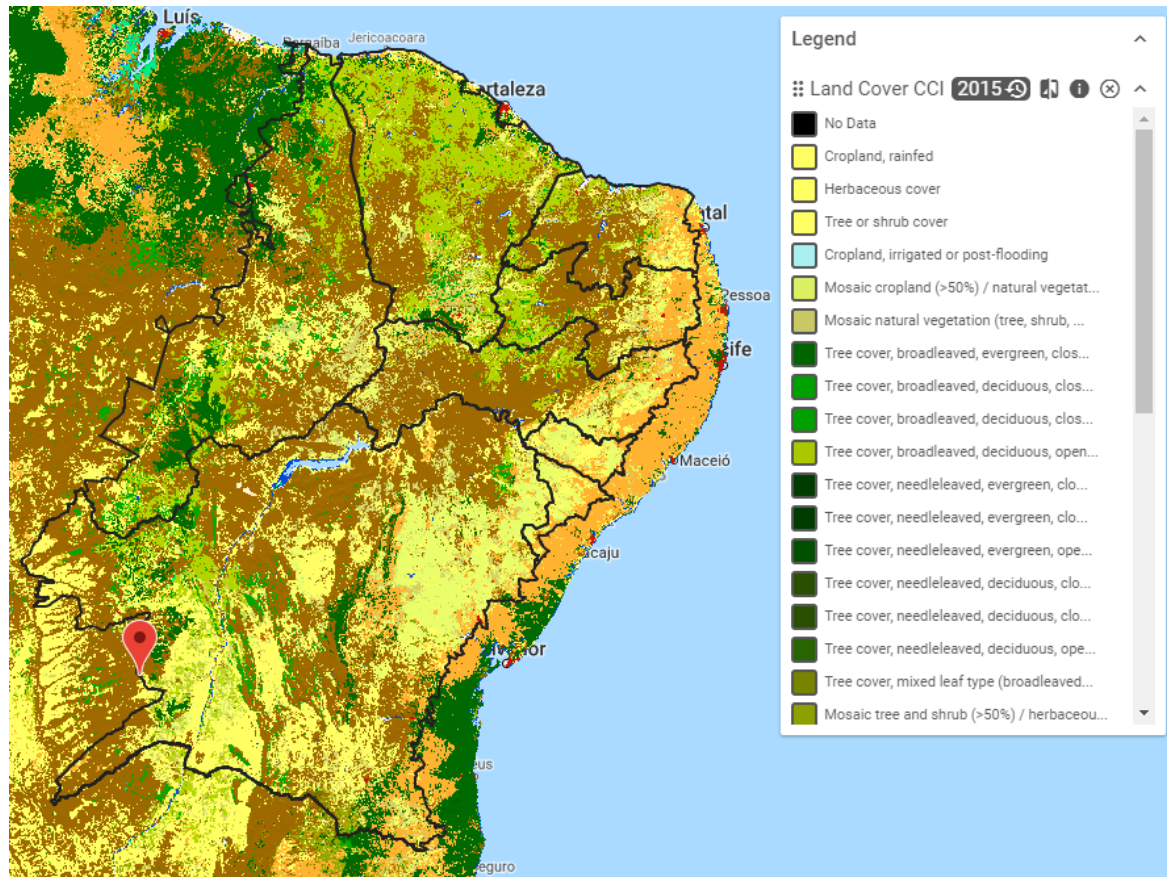


Figure 6 Land Cover¹⁵

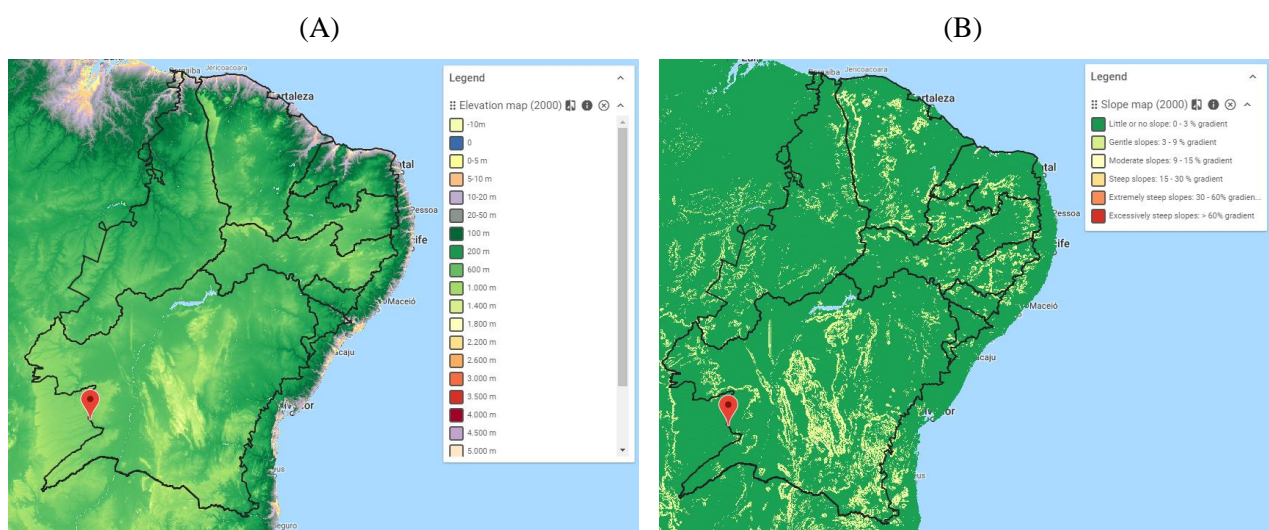


Figure 7 (A) Elevation Map of NEB¹⁶, and (B) Slope

¹⁴ MCD64A1.006 MODIS Burned Area Monthly Global 500m

¹⁵ ESA Land Cover CCI (300 m spatial resolution)

¹⁶ SRTM Digital Elevation Data Version 4

Figure 8 presents anomalies regarding minimum and maximum temperatures and precipitation. These are calculated by comparing average records between the period 2013 – 2017 against the period 1989 – 2017, and presented in deviation by pixel for each select data set. Important variations in temperature and precipitation were perceived and coincide with statistics on the 2011-2016 drought having areas of Semiarid NEB with monthly max temperature deviations of up to 2.47°C and monthly precipitation deviations ranging from approximately -90.28 mm to 117.00 mm.

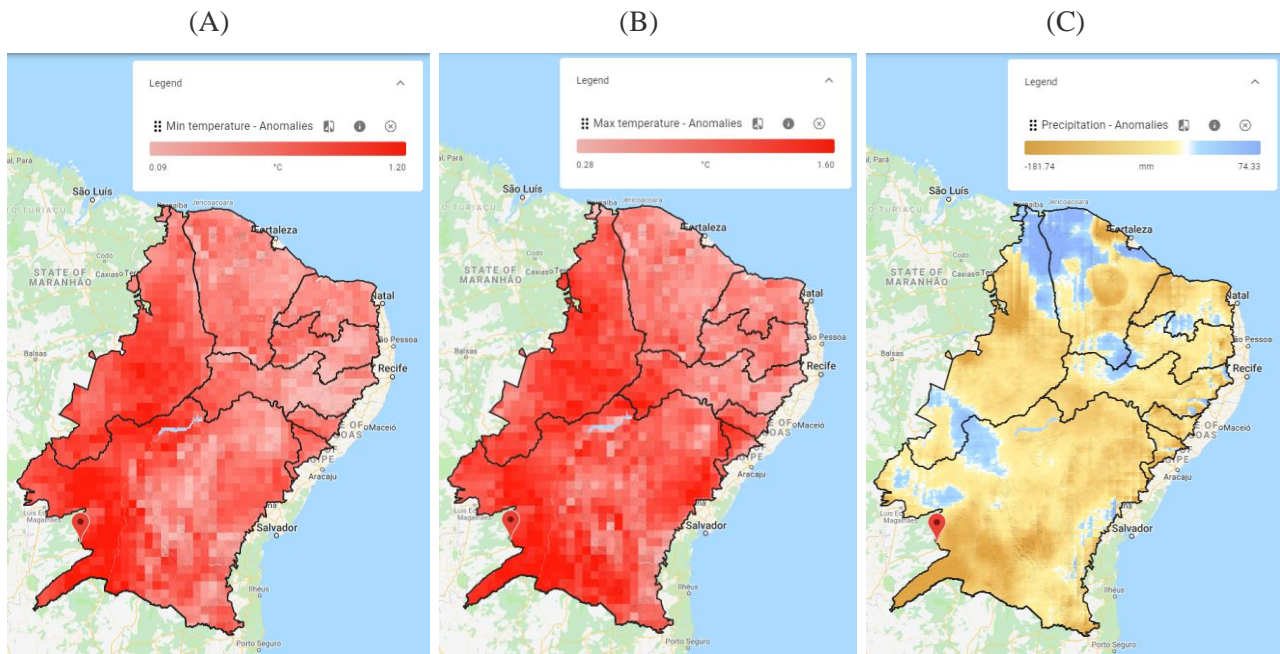


Figure 8 (A) Min and (B) Max¹⁷ temperature anomalies; (C) Precipitation anomalies¹⁸

Normalized Difference Vegetation Index (NDVI) provides an alternative measure of vegetation amount and condition. Figure 9 presents the average NDVI for the period 2016-2018 (A) and the absolute yearly change between the period 2001-2018 (B). As can be seen, most portions of the Semiarid NEB have suffered consistent reductions in NDVI for the analyzed period. Notwithstanding the negative trend and high risk of tree loss (figure 10) under a BaU RCP 8.5 scenario; the region also has an important capacity to support the restoration of tree cover under adequate management policies and practices.

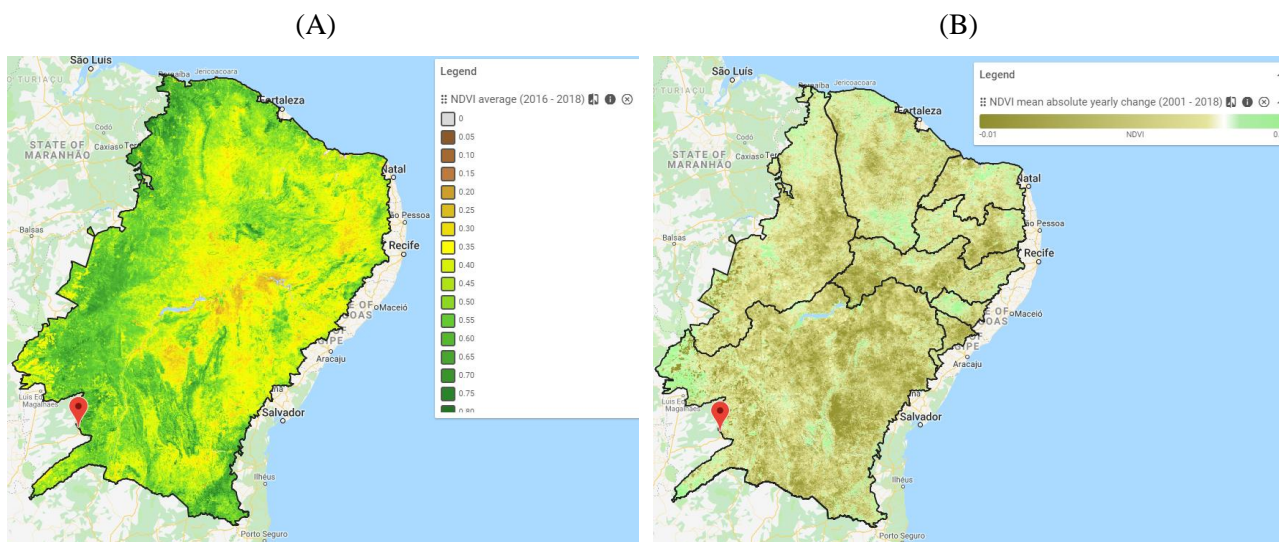


Figure 9 (A) NDVI Average 2016 - 2018; (B) NDVI absolute yearly change¹⁹

¹⁷ ECMWF Dekadal Minimum and Maximum Temperature

¹⁸ CHIRPS pentad: Climate Hazards Group InfraRed Precipitation with Station data (version 2.0 final)

¹⁹ LP DAAC derived from processing MOD13A1 Vegetation Indices 16-Day L3 Global

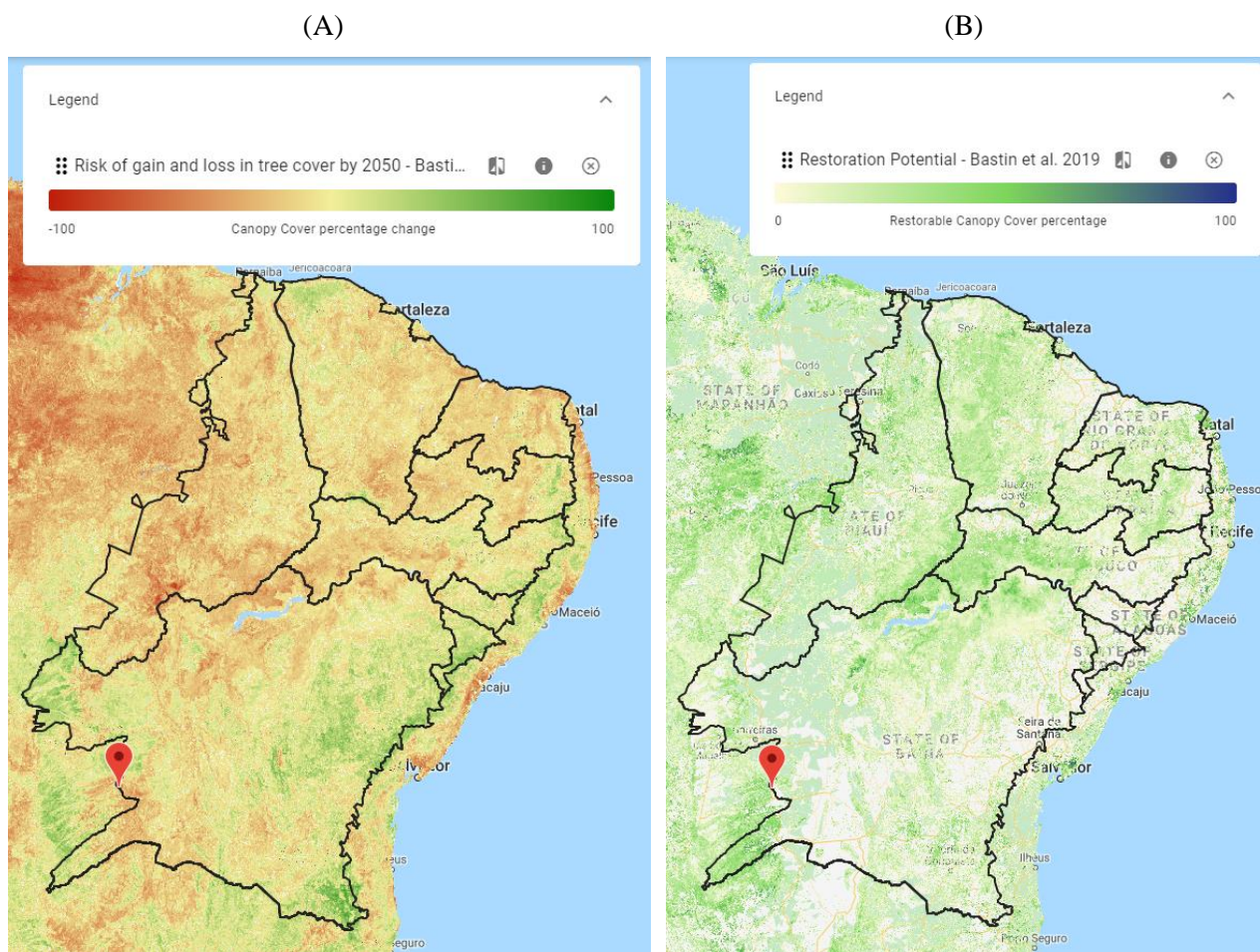


Figure 10 (A) Risk of gain and loss in tree cover under a “BaU” scenario RCP 8.5; and (B) restoration potential²⁰

An analysis on drought events that occurred in the Semi-arid region of Northeast Brazil from 1981 to 2016²¹ reveals that drought intensity for the last 36 years has been increasing and that **recent droughts were more frequent, more severe and affected a more substantial area** with significant impacts for population, as well as economic activities (as can be seen in figures 11, 12 and 13 below). Drought intensity was measured by three indicators: duration, which equals the number of months of the event; frequency, the number of events per period; and severity, which measures the absolute negative value of the hydro-meteorological and agricultural indexes used.

²⁰ The global tree restoration potential (Bastin et al. 2019)

²¹ BRITO, S. S. B.; et.al. Frequency, duration and severity of drought in the Semi-arid Northeast Brazil region, International Journal of Climatology, n. 2017, 2017.

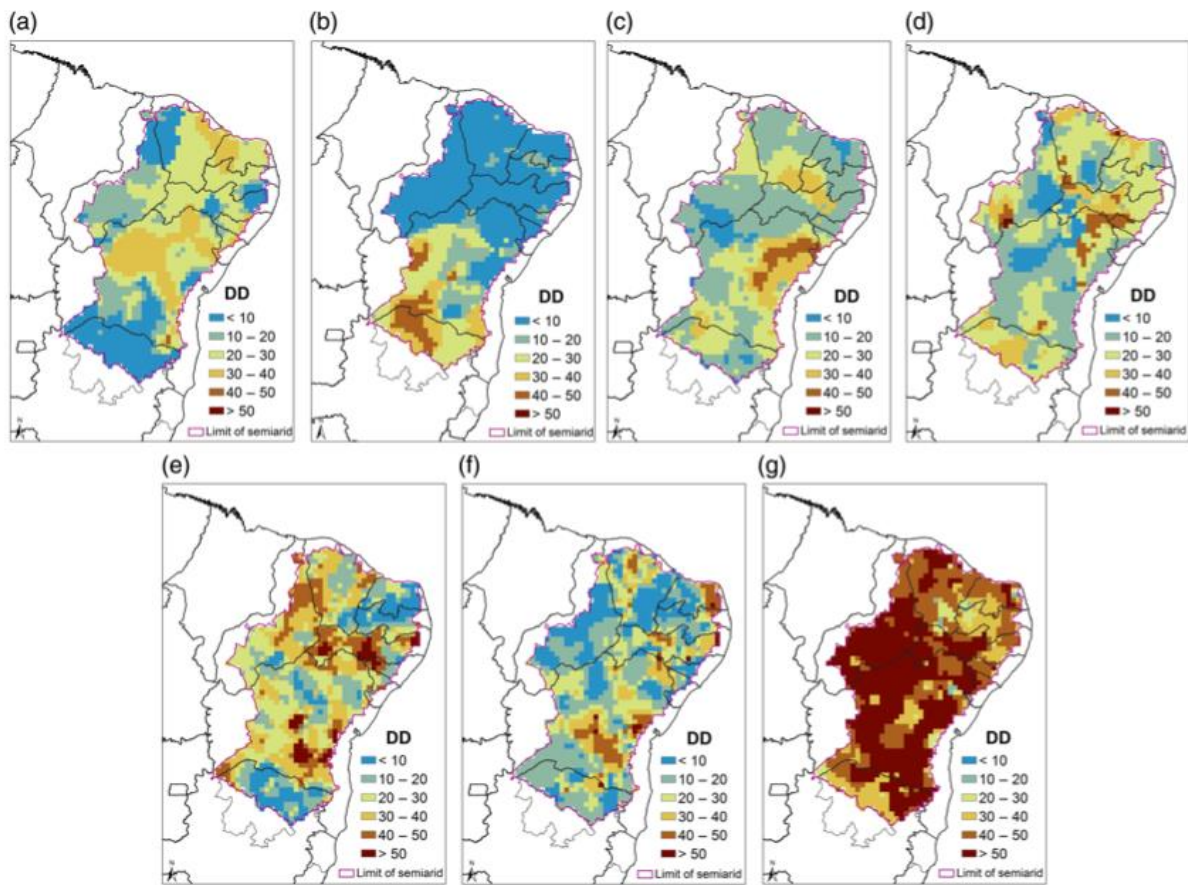


Figure 11 Drought duration maps for (a) 1981-1986, (b) 1986-1991, (c) 1991-1996, (d) 1996-2001, (e) 2001-2006, (f) 2006-2011 and (g) 2011-2016.²¹

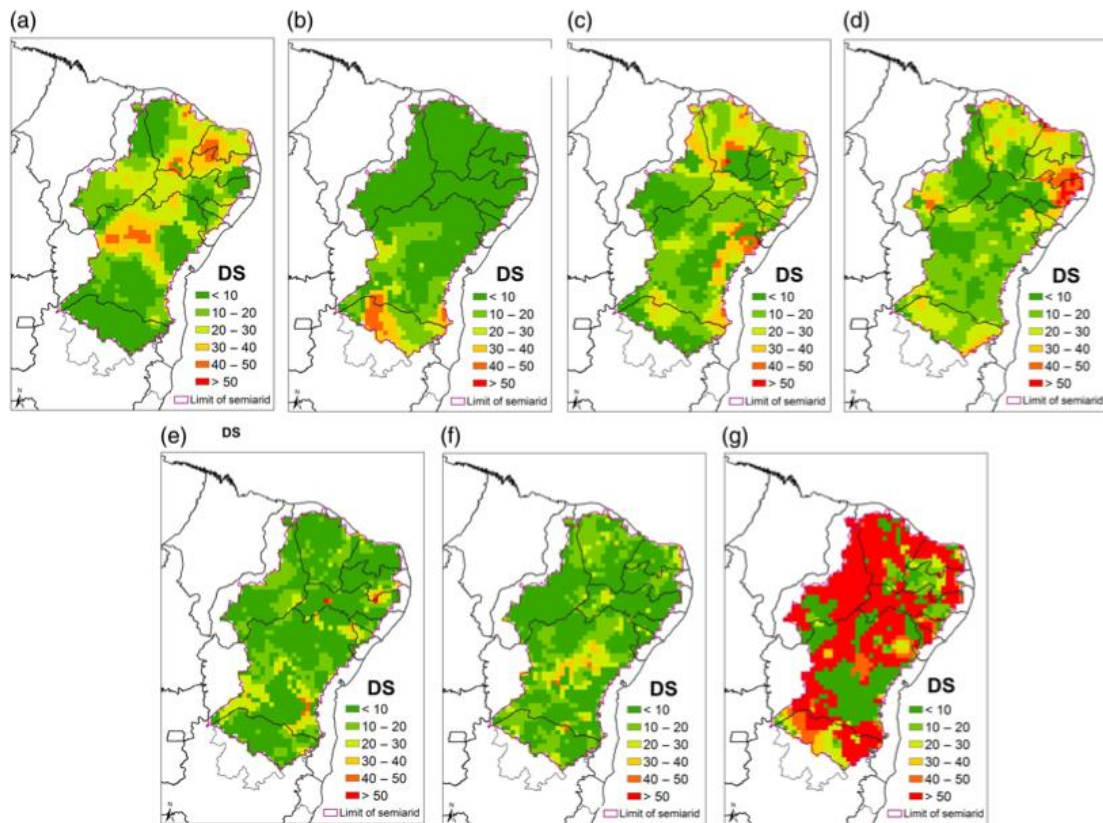


Figure 12 Drought severity maps for (a) 1981-1986, (b) 1986-1991, (c) 1991-1996, (d) 1996-2001, (e) 2001-2006, (f) 2006-2011 and (g) 2011-2016²¹²³

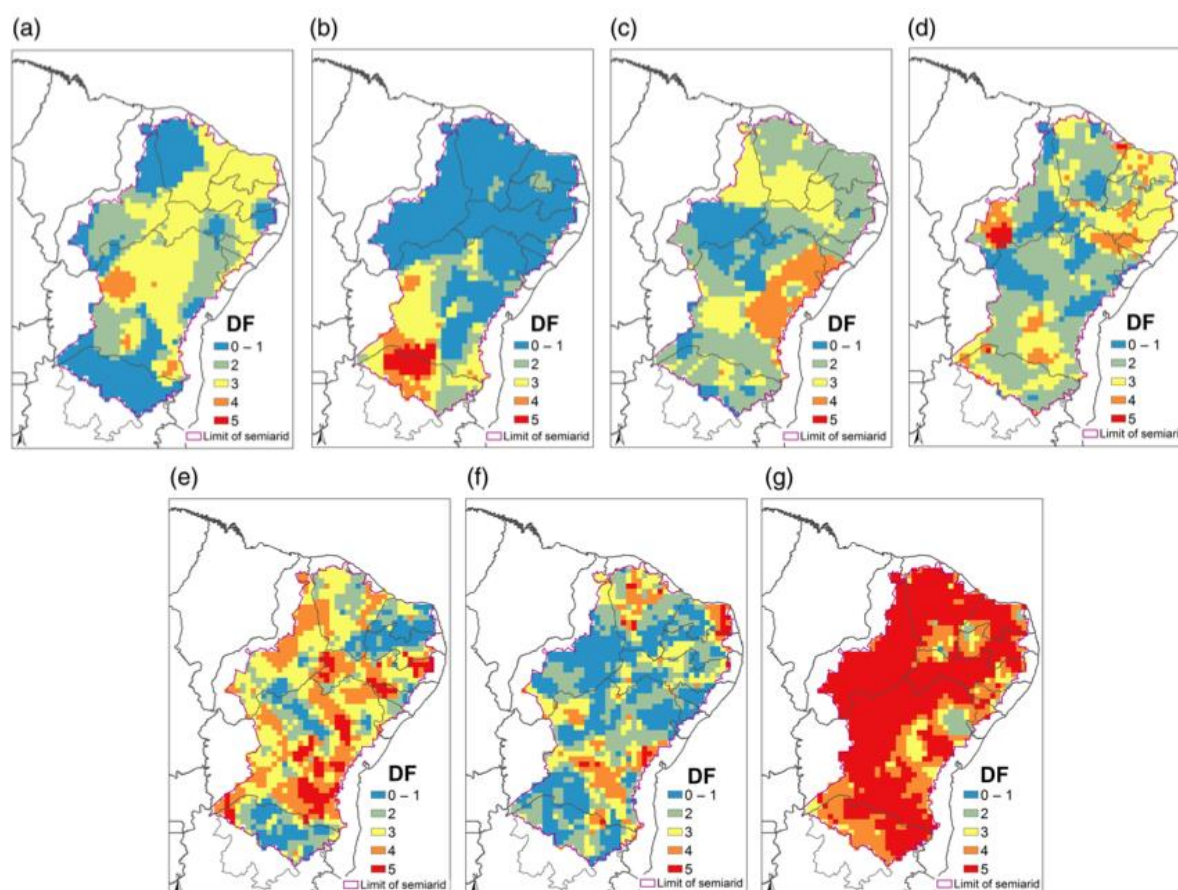


Figure 13 Drought frequency maps for (a) 1981-1986, (b) 1986-1991, (c) 1991-1996, (d) 1996-2001, (e) 2001-2006, (f) 2006-2011 and (g) 2011-2016²¹

The drought that affected this region during 2011-2016 is considered the worst in the past 100 years and has exacerbated many social problems through the indebtedness of farmers, migration, disease, and malnutrition.²² The estimated economic losses of this drought event are in the order of US\$ 6 billion in the agricultural sector alone.²⁴ Regarding the impact on water supply, the water reserves of the equivalent reservoirs (storage capacity above 10 hm³) in the Northeast have presented successive reductions since 2012, which resulted in a minimum stored volume of approximately 13.8% in March 2017.

2.2.2 Greenhouse Gas Emissions in NEB

Concerning the issue of mitigation, Brazil has the world's sixth-largest greenhouse gas (GHG) emissions and has released 2.3 billion tons of carbon dioxide equivalent (CO₂e) in 2016, compared with 2.1 billion in 2015. In 2016 emissions were 8.9% higher than in 2005, distancing the country from its Paris goal of reducing 37% of its carbon emission by 2025 compared to 2005 levels.²⁵ GHG emissions in Brazil are mainly due to forest and grassland conversion, followed by agriculture and fossil fuel combustion. Land-use change and agriculture accounted for 73% of all the carbon emitted in 2016.²⁶

Total emissions in the nine states of the Northeast accounted for a quarter of Brazil's total emissions (591.4 MtCO₂e) in 2016. Land use, land-use change and forestry (LULUCF), with 381.8 MtCO₂e (65%), was the primary cause of emissions, followed by agriculture with 106.9 MtCO₂e (18%) and energy with 102.7 MtCO₂e (17%). Land-use change, specifically the deforestation of the *Caatinga* biome, represented almost

²² Gutiérrez APA, Engle NL, De Nys E, Molejon C, Martins ES (2014) Drought preparedness in Brazil. *Weather Clim Extremes* 3:95–106. doi:10.1016/j.wace.2013.12.001

²³ Marengo, Jose A., et al. "Climatic characteristics of the 2010-2016 drought in the semi-arid Northeast Brazil region." *Anais da Academia Brasileira de Ciências* 90.2 (2018): 1973-1985.

²⁴ Marengo, Jose A., Roger Rodrigues Torres, and Lincoln Muniz Alves. "Drought in Northeast Brazil—past, present, and future." *Theoretical and Applied Climatology* 129.3-4 (2017): 1189-1200.

²⁵ Carbon Brief, 2018. Retrieved at: <https://www.carbonbrief.org/state-of-the-climate-how-world-warmed-2018>.

²⁶ The Greenhouse Gas Emissions and Removals Estimates (SEEG), 2018. Retrieved at: <http://seeg.eco.br>.

5% of the carbon emissions (28.2 MtCO₂e). With 93.7 MtCO₂e emitted, enteric fermentation represented 88% of the agricultural emissions and 16% of the emissions in the Northeast.

Finally, with 102.7 MtCO₂e emitted the energy sector emissions in the Northeast are caused mainly by fuel production, energy generation, road transport and the industrial sub-sector. Renewable biomass from waste material such as coconut husk, cashew nut shells as well as wood from sustainably managed forest plantations and agroforestry systems could be vital to helping the Northeastern states move towards more renewable sources of energy and halt deforestation of the Caatinga.

2.3 Climate change scenarios

The Brazilian National Institute for Space Research (INPE) has been providing the government with regional climate scenarios by downscaling global climate models. Four sets of downscaling simulations based on the Eta Regional Climate Model forced by two global climate models, the HadGEM2-ES and the MIROC5, and two RCP scenarios—8.5 and 4.5, have been carried out²⁷.

Projections point to the warming of the entire continent. For the Northeast region, accordingly, the simulations (HadGEM2-ES and MIROC5 for two RCP scenarios—8.5 and 4.5) predicted a temperature increase from 0.5 – 2.0°C in the period 2011- 2040 compared to a baseline period of 1961-1990²⁸. It is expected that the interior – which is already becoming drier – would be more affected than the coastal areas.²⁹ Despite the rise of precipitation in the summer, the projected annual cycle shows a dominating annual **reduction of rainfall in the region**. Furthermore, an **increase in the length of consecutive dry days** and wide climate variability are common features in these and other simulations for the Northeast of Brazil³⁰. Dry summer months are expected to perceive a moderate increase between 2 and 6 °C in Northeastern Brazil³¹. Impacts are expected to grow exponentially within a range temperature increase of approximately 4.5 °C for the period 2041 and 2070, in line with IPCC projections.

A specific study in the Northeast confirmed the findings of the South American downscaling scenarios discussed above. Both station data analysis and numerical simulations (for the periods of 1960-2000 and 2010-2050) revealed **trends of increasing maximum temperature** and **diminishing precipitation**. The water-balance calculations showed reduced soil moisture availability and total rainfall. The atmospheric model simulations were consistent with the station data regarding the present warming; the climate change scenarios for 2010-2050 indicated a faster increase of daily maximum temperature over the Northeast compared to that simulated for the recent past.³²

²⁷ CHOU, S.C.; et.al. Assessment of Climate Change over South America under RCP 4.5 and 8.5 Downscaling Scenarios. **American Journal of Climate Change**, v. 03, p. 512-527, 2014.

²⁸ Chou, SC; et.al. Assessment of Climate Change over South America under RCP 4.5 and 8.5 Downscaling Scenarios. *American Journal of Climate Change*, v. 03, p. 512-527, 2014.

²⁹ International Policy Centre for Inclusive Growth (IPC-IG) Working Paper No.141; UNDP, 2016. "Climate change and impacts on family farming in the North and Northeast of Brazil"

³⁰ LACERDA, F. F.; et.al. Long-term Temperature and Rainfall Trends over Northeast Brazil and Cape Verde. **Journal of Earth Science & Climatic Change**, v. 6, n. 8, p. 296, 2015.

³¹ INPE. 2015. "Cenários de Mudanças Climáticas: Regionalização." Unpublished. São José dos Campos: Instituto Nacional de Pesquisas Espaciais.

³² RIBEIRO NETO, A; ROLIM DA PAZ, A; RAIMUNDO DA SILVA, E. Impactos e vulnerabilidade do setor de recursos hídricos no Brasil às mudanças climáticas. In: BRASIL. MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO (Eds) **Modelagem Climática e Vulnerabilidades Setoriais à Mudança do Clima no Brasil**. Brasília, Ministério da Ciência, Tecnologia e Inovação, (p. 189 – 240), 2016.

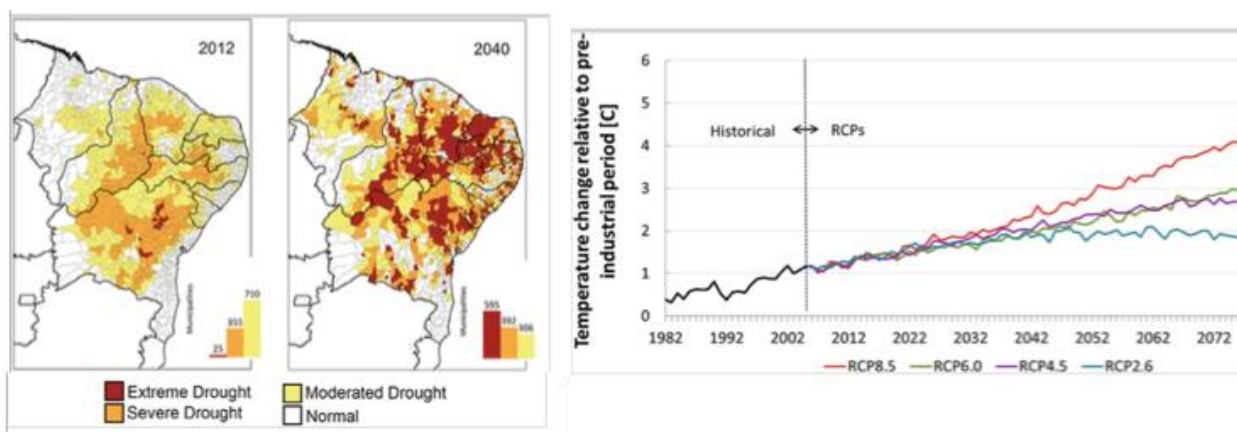


Figure 14 Municipalities affected by the drought, according to (A) observed Vegetation Health Index (VHI) for 2012, (B) future projections for 2040, (C) CMIP5 annual temperature changes.³³

From the RCP2.6 (Fig. 14) the Temperature Change Stabilizes at 2 °C above the average around 2040. On the other hand, the RCP8.5 Scenario Drives End-of-Century Temperature increases in excess of 5 °C. The 3 °C warming level is reached in 2050 for the RCP 8.5 and in the middle 2070s and end of the 2090s for the RCP 6.0 and 4.5 respectively. The RCP 8.5 shows warming of 4 °C starting in 2070 and 5 °C starting in 2090. ³³

Intense thermal stress accompanied by moisture-stress can intensify the vegetative drought. These points can be verified from the VHI projections under various RCP scenarios over grasslands in semiarid for the present and future. Drought risk is defined by the intensity of the VHI and the percentage of the area of the municipality affected by drought. To define extreme drought in Figure14, the VHI index varies from 0 to 10 and at least 75% of the area of a municipality is affected by drought. For severe drought, the VHI varies between 10 and 20, and the area affected by drought should be at last 50% of the municipality. In 2012, which was the most affected year of the last drought event in Northeast Brazil²⁴, the number of municipalities in extreme drought was 25, severe drought 355 and moderate drought 710. Marengo et al. (2018) show projections for 2040, of 595 municipalities under the risk of extreme drought, 392 to under risk of severe drought and 306 under moderate drought risk.

When modelling surface and groundwater supplies per water basin, the results for the Northeast region are alarming, **estimating a sudden reduction in flows by 2100** in the river basins that supply the region: *São Francisco, Atlântico Norte e Nordeste* and *Atlântico Leste*. Such a scenario is of concern, given that the Northeast's interior is already becoming drier and experiencing a seven-year continuous cycle of prolonged severe droughts from 2011-2017³⁴.

2.4 Baseline Scenario: Sources of vulnerability and climate impacts

Low-income family farmers, the target group of this project, face very harsh and challenging conditions for developing productive and sustainable livelihoods. According to a study by the Ministry of Environment, (*Ministério do Meio Ambiente – MMA*), the Ministry of National Integration (*Ministério da Integração Nacional – MIN*) and WWF – Brasil³⁵, the Northeastern Semiarid region is the most vulnerable region to climate change in the country, as suggested by the map below.

³³ MARENGO, J. A., et al. "Increase Risk of Drought in the Semiarid Lands of Northeast Brazil Due to Regional Warming above 4 °C." Climate change risks in Brazil. Springer, Cham, 2019. 181-200.

³⁴ RIBEIRO NETO, A.; ROLIM DA PAZ, A.; RAIMUNDO DA SILVA, E. Impactos e vulnerabilidade do setor de recursos hídricos no Brasil às mudanças climáticas. , In: BRASIL. MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO (Eds) **Modelagem Climática e Vulnerabilidades Setoriais à Mudança do Clima no Brasil**. Brasília, Ministério da Ciência, Tecnologia e Inovação, 2016. p. 189 – 240.

³⁵ BRASIL-MMA; BRASIL-MIN; WWF-BRASIL. **Índice de vulnerabilidade aos desastres naturais relacionados às secas no contexto da mudança do clima** Brasília: Ministério do Meio Ambiente, Ministério da Integração Nacional e WWF - Brasil, 125 p., 2017. Available at: https://d3nehc6yl9qzo4.cloudfront.net/downloads/estudo_secas_completo_com_isbn.pdf.

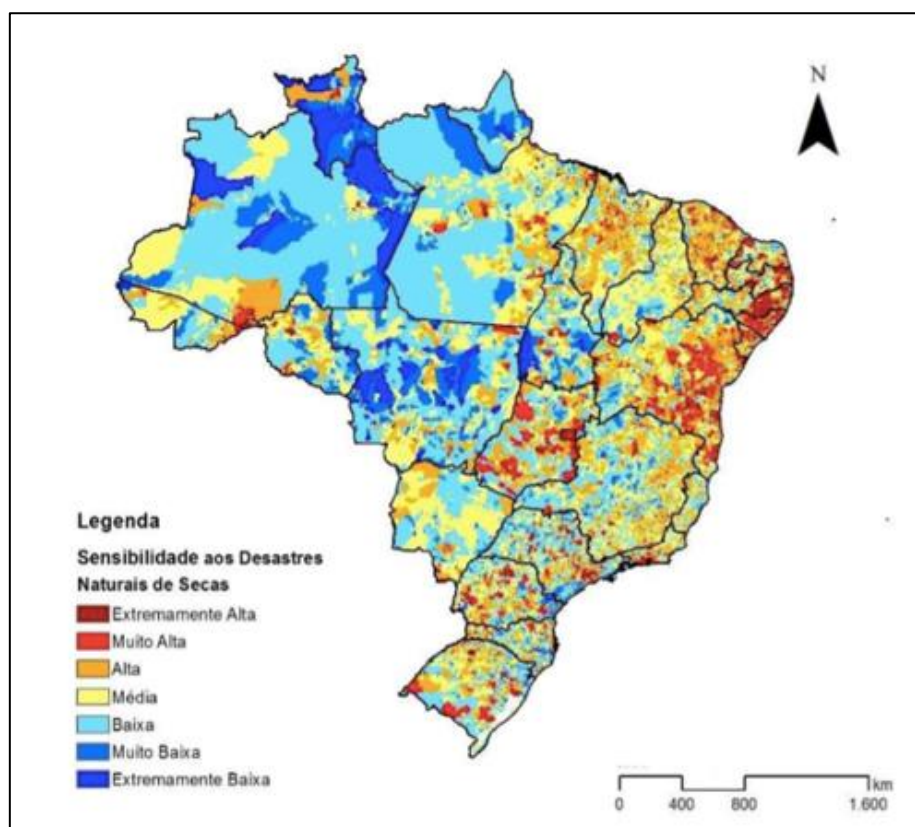


Figure 15 Sensitivity to Droughts ^{36;37}

Superimposing climate change upon pre-existing social-economic vulnerabilities places intense pressure on freshwater availability and quality in the region translating into losses of arable land, desertification, increased food insecurity and reduced local economic activities that lower farmers' income and result in rural exodus. The climate change vulnerabilities of Brazil's semiarid region are a consequence of sensitivity and adaptive capacity factors that reinforce one another and exacerbate the impacts of climate change. The main ones are: a) high poverty incidence, b) water scarcity and poor quality; c) inadequate productive practices, and d) deforestation of the *Catinga* Biome depleting the ecosystem services.

2.4.1 Poverty in the region

Brazil is placed in a high human development category (0.761 in 2019), ranking 79th in the world. However, it ranks second in income inequality, with one third of the wealth in the hands of the richest 1%. Over half (59.1%) of Brazilians living in extreme poverty are in the Northeast region. Historically, the area has been the single largest pocket of rural poverty in Latin America; and, despite improvements over the past 25 years, it still is Brazil's most impoverished region, hosting 3 million of those living in extreme poverty, of which 46% belong to households in rural areas.³⁸

The municipal human development index (m-HDI) of the semiarid rural municipalities in the Brazilian Northeast region ranges from 0.443 to 0.710, with an average of 0.587³⁹. Although the indexes have improved over the past 25 years, semiarid NE Brazil is still plagued by several social malaises, especially in rural areas where the percentage of the population living in poverty⁴⁰ is around 50% in the nine States. Worst yet, in some

³⁶ From top to bottom: Extremely High; Very High; High; Medium; Low; Very Low; Extremely Low.

³⁷ BRASIL-MMA; BRASIL-MIN; WWF-BRASIL. **Índice de vulnerabilidade aos desastres naturais relacionados às secas no contexto da mudança do clima**. Brasília: Ministério do Meio Ambiente, Ministério da Integração Nacional e WWF - Brasil, 125 p., 2017. Available at: https://d3nehc6yl9qzo4.cloudfront.net/downloads/estudo_secas_completo_com_isbn.pdf.

³⁸ PNUD; IPEA; PINHEIRO, F. J. **Atlas do Desenvolvimento Humano no Brasil - 2010**. Brasília: PNUD, 2013. Available at: <http://www.atlasbrasil.org.br/2013/>.

³⁹ PNUD; IPEA; PINHEIRO, F. J. **Atlas do Desenvolvimento Humano no Brasil - 2010**. Brasília: PNUD, 2013. Available at: <http://www.atlasbrasil.org.br/2013/>.

⁴⁰ The criteria to define poverty and extreme poverty in Brazil are the following: Extremely poor: with a monthly per capita household income of less than 1/8 of the minimum wage, or less than R\$63, according to the 2010 Demographic Census. Poor: with a monthly per capita household income of 1/8–1/4 the minimum wage, or R\$63–R\$127. These figures refer to the value of the minimum wage of R\$510 in effect in 2010, when the last national Demographic Census was conducted: Demographic Census /IBGE.

states, the extreme poverty rates are about 40%. Infant mortality in the rural northeastern states varies between 23 and 33 deaths per thousand births, reaching almost double the national average of 16.7 in 2010. The illiteracy rate is also striking in the region (ranging from 42% to 32%) when compared to a national average of 9.63%.

The semiarid or *Sertão* (its common name in Brazil) is characterized by a significant imbalance in land ownership, and most of the impoverished are smallholding family farmers⁴¹. These family farms account for over 90%⁴² of farms in the semiarid drylands of NE Brazil. According to data from the 2006 agricultural census, approximately 2 million family farms employed over 6.5 million people in the Northeast, covering a total of 28 million ha, which accounted for 52% of the value of production and 87% of the total labor in the sector.⁴³

These family farms are less than twenty hectares in size.⁴⁴ Despite some variants, they generally blend annual rain-fed agriculture harvesting food crops – mainly maize, beans and cassava – for home consumption and sale, with livestock-raising.⁴⁵ Whenever possible, families also have backyard vegetable gardens, a few fruit trees and poultry. In rare cases, there is a small irrigated area.

Food crop plots occupy a part of these smallholdings. Forage growing areas are also present, those include cultivated pastures and forage production plots, with, for example, fodder cactus (known as *palma forrageira*)⁴⁶ cultivation. Generally, the properties also have an area of native vegetation (*Caatinga*), commonly used as grazing land. The *Caatinga* is used as a source of fodder and is also the source of other 'extractive' products, such as fruit, firewood, nuts, etc. Also, most family establishments suffer from what can be called 'water insecurity', characterized by an insufficient capacity to collect and store water reserves.

A deep economic recession that began in 2015 in Brazil aggravated these factors. The real GDP per capita fell approximately ten percentage points between 2014 and 2016⁴⁷ and unemployment rose to 13.7% in 2017.⁴⁸ From 2014 to 2017 poverty increased by 33%, climbing from 8.38% to 11.18% of the Brazilian population.⁴⁹ This contingent represents 23.3 million poor people in the country, of which the most impacted regions were the North and Northeast. In addition to the recession, in the same period, the Brazilian government introduced significant spending cuts that had a substantial impact on agricultural subsidies and public policies targeting family farming. The government reduced the Safrá Plan and the budget for the Program for Strengthening Family Farming (PRONAF), the National School Feeding Program (PNAE), the Food Acquisition Program (PAA), the National Policy for Technical Assistance and Rural Extension (PNATER), the housing policy *Minha Casa Minha Vida* in rural areas, among others (these programs are explained in detail later in section 3.2.1).

Concerning the climate vulnerability of family farming systems in the region, Burney et al. affirm that the *coping* capacity of farming families before climate stress often depends upon the availability of assets (for

⁴¹ BURNEY, J. et al. Climate change adaptation strategies for smallholder farmers in the Brazilian Sertão. *Climatic Change*, v. 126, n. 1 – 2, pp. 45 – 59, 2014.

⁴² A study on the São Francisco Sertão Territory, in Bahia State, shows that 90.7% of all agricultural production units are family farms. (Articulação Nacional-de-Agroecologia, **Desenvolvimento rural sustentável e agroecologia no Sertão do São Francisco baiano: contribuição das redes territoriais e do Projeto Ecoforte**. Documento não publicado, 2018).

In the Chapada do Vale do Itaim Territory of the Sertão in Piauí State, this percentage reaches 92.7%. (SIDERSKY, P. **Sobre a cadeia produtiva da caprinovinocultura no Sertão do Piauí: um estudo centrado no Território da Chapada do Vale do Itaim [região de Paulistana]**. Salvador: SEMEAR-FIDA-IIICA, 2017. 106 p.). Available at:

<http://www.fida.org.br/assets/downloads/Estudo%20de%20caso%20sobre%20caprinovinocultura%20-%20região%20de%20Paulistana.%20Piauí%20AD.pdf>.

⁴³ GUANZIROLI, C. E.; DI SABBATO, A.; VIDAL, M. DE F. **Agricultura familiar no Nordeste: uma análise comparativa entre dois censos agropecuários**. Fortaleza: Banco do Nordeste do Brasil, 172 p., 2011.

⁴⁴ Using data from the 2006 Census of Agriculture 2006 conducted by the Brazilian Institute for Geography and Statistics (IBGE), a study of the São Francisco do Sertão Territory in Bahia State showed that 62% of the farms and ranches in this Territory cover between 0 and 20 hectares.

⁴⁵ Particularly in the states of Piauí, Ceará and Rio Grande do Norte, there are areas where cashew tree groves are often found on family farms, in addition to shifting food-crop plots and livestock. There is also a territory in Bahia State where almost all family farms have areas set aside for perennial sisal plantations.

⁴⁶ Imported from Mexico, several species of fodder cactuses were introduced into the semiarid region. The most common are: *Nopalea cochenillifera* Salm-Dyck and *Opuntia ficus-indica* Mill.

⁴⁷ ROSSI, J. L. **Development Challenges in Brazil** - IDB Policy Brief 282. Brasília: Inter-American Development Bank, 2018.

⁴⁸ IBGE (2017). Pesquisa Nacional por Amostra de Domicílios Contínua (PNAD). Available at:

<https://www.ibge.gov.br/estatisticas/sociais/habitacao/17270-pnad-continua.html?=&t=o-que-e>.

⁴⁹ NERI, M. **Qual foi o Impacto da Crise sobre a Pobreza e a Distribuição de Renda?** Rio de Janeiro: Fundação Getúlio Vargas, 2018. Available at: https://www.cps.fgv.br/cps/bd/docs/NOTA-CURTA-Pobreza-Desigualdade-a-Crise-Recente_FGV_Social_Neri.pdf.

example, assets that may be depleted in a given year to overcome a climate shock). It follows, therefore, that poverty can hinder coping capacity, making these families more vulnerable to climate stress⁵⁰.

Family farmers are the most affected by climate change. There is a significant correlation between average precipitation and agricultural production, but the effect is statistically significantly higher for crops produced by family farmers than average production. The average crop area lost due to droughts in the 1990-2016 period was 221,973 hectares per year.⁵¹ This is particularly relevant considering that current productivity in the semiarid is already low; hence, any further losses would threaten food security in the region, with consequent repercussions on both local and national food security. Besides, the expected climate changes may exacerbate other environmental problems that already affect family farming in the semiarid: animal breeding, wild plant gathering, soil degradation, and pests, dissemination of diseases and weeds and desertification.

The drought of 2011–2017, which is considered the worst in the past 100 years, has exacerbated many social problems through the indebtedness of farmers, migration, disease, and malnutrition.⁵² The estimated economic losses are in the order of \$US 6 billion in the agricultural sector alone.⁵³ States reported an annual crop production reduction ranging from 30-75% when compared to the average in the years previous to the drought (2009/2010). In addition to the farmers' income, the prolonged climatic event affected local food markets. Whereas before the drought 80% of beans, 55% of manioc and 52% of maize sold in the Northeast came from local farmers, during the drought their participation fell to 47%, 46% e 16%, respectively.⁵⁴ Animal husbandry also suffered setbacks, losing in 2012 1.3 million bovines, 700,000 sheep, 780,000 goats⁵⁵, and 75% of the beehives.⁵⁶

Projections estimate possible losses of up to 79.6% in agro-productive areas and subsequent increase in food insecurity and health issues due to climate change and maladaptive practices.⁵⁷ Staple food crops, such as beans, corn and cassava, can suffer productivity losses up to 5% by 2030 in the Northeast due to climate change. Some scenarios even project that manioc can disappear from the region⁵⁸. Projections indicate that while most crops, including coffee, sugarcane, oranges and cotton, will be affected, maize and wheat will be the most severely impacted.⁵⁹ From 2017 to 2030, a 10% precipitation reduction scenario could cause an average annual loss of R\$ 96.7 million in family farmer's agriculture production value. If the rainfall reduction is 20%, these losses increase to a yearly loss of R\$ 193.3 million in family farmer's agriculture production value⁶⁰.

Main issues affecting agricultural productivity will arrive from increasing temperatures, changes in amount and distribution of rainfall, and increased droughts intensity and occurrence. Maladaptation practices derived from agricultural intensification (e.g. with subsequent deforestation and soil erosion) will further affect NEB and its agricultural sector. This negative consequence is particularly relevant considering that the current productivity in the semiarid is already low; hence any further losses would mean a more significant threat to food security in the region, with consequent repercussions on both local and national food security. Besides, the expected climate changes may exacerbate other environmental problems that already affect family farming in the semiarid, like soil degradation, pests, dissemination of diseases and weeds and desertification.

⁵⁰ BURNEY, J. et al. Climate change adaptation strategies for smallholder farmers in the Brazilian Sertão. **Climatic Change**, v. 126, n. 1 – 2, pp. 45 - 59, 2014.

⁵¹ YOUNG, C.E. et al. Drought in the Brazilian Semi-Arid. Study commissioned by IFAD (please see Annex 23).

⁵² GUTIÉRREZ, A. P. et al. Drought preparedness in Brazil. **Weather and Climate Extremes**, v. 3, p. 95 - 106, 2014. Retrieved at: https://www.researchgate.net/publication/262922408_Drought_preparedness_in_Brazil.

⁵³ MARENGO, J. A.; RODRIGUES TORRES, R.; ALVES, L. M. Drought in Northeast Brazil — past, present and future. **Theoretical and Applied Climatology**, v. 124, n. 3-4, p. 1189 - 1200, 2016.

⁵⁴ BRASIL-MAPA. **Informativo sobre a Estiagem no Nordeste - nº 113 - 31/10/2017**. Brasília: Ministério da Agricultura, Pecuária e Abastecimento, 2017. Available at: <http://www.agricultura.gov.br/assuntos/politica-agricola/combate-a-seca-1/arquivos-combate-a-seca/113.pdf>.

⁵⁵ MADEIRO, C. 2013. Seca fez Nordeste perder 4 milhões de animais em 2012, diz IBGE... – Available at: <https://economia.uol.com.br/agronegocio/noticias/redacao/2013/10/15/seca-fez-nordeste-perder-4-milhoes-de-animais-em-2012-diz-ibge.htm?cmpid=copiaecola>.

⁵⁶ VIDAL, M. D. F. Efeitos da seca de 2012 sobre a apicultura nordestina. **Informe Rural**, v. 7, n. 2. Available at: https://www.bnb.gov.br/documents/88765/89729/%20ire_ano7_n2.pdf/7a9e8843-0f57-4ed8-b737-0a6096c915cd, 2013.

⁵⁷ BARBIERI, A.; CONFALONIERI, U. E. C. (2010). Migrações e saúde: cenários para o nordeste brasileiro, 2000-2050. Viabilização do semiárido do Nordeste um enfoque Multidisciplinar, 45-65.

⁵⁸ MACHADO FILHO, H. et al. **Climate change and impacts on family farming in the North and Northeast of Brazil. Working Paper 141**. Brasília: IPC-IG/UNDP; IFAD - Semear; IPEA, 61 p., 2016. (This study was commissioned and paid for by IFAD).

⁵⁹ USAID, 2018. Climate Risk Profile. Fact Sheet. Available at: <https://www.climate-links.org/sites/default/files/asset/document/2018-April->

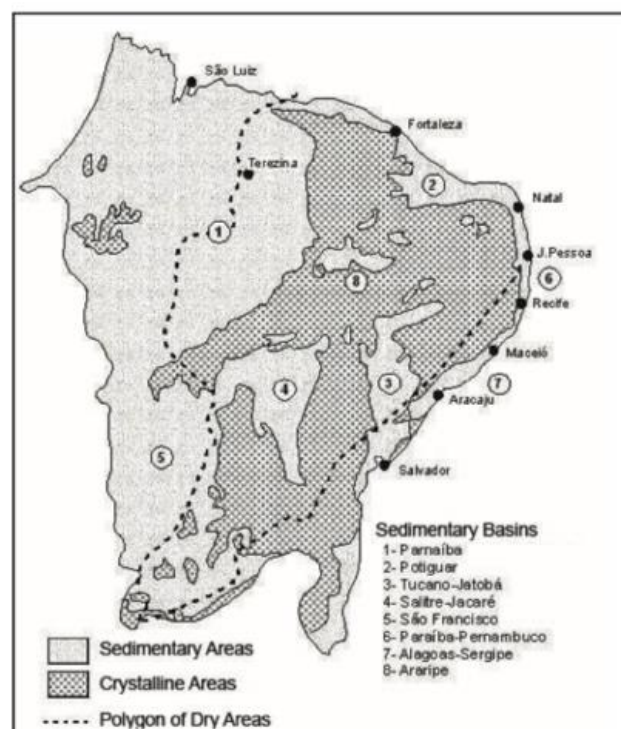
³⁰ _USAID_CadmusCISF_Climate-Risk-Profile-Brazil.pdf

⁶⁰ YOUNG, C.E. et al. Drought in the Brazilian Semiarid. Study commissioned by IFAD (please see Annex 23).

2.4.2 Water is scarce and of poor quality

Brazil holds 12% of the world freshwater; however, the distribution of this resource is disproportionate across its territory and the population's demand. The Northeast represents the most critical situation, with only 3.3% of the country's water volume. Water is a scarce natural resource in the semiarid region. Water scarcity is intrinsically related, on the one hand, to the low rainfall and the high evaporation rates and, on the other hand, to its geological structure - a crystalline shield that does not allow for sufficient accumulation of water in the subsoil.

The Semiarid northeastern territory is constituted of more than 80% crystalline rock (as can be seen in Figure 16), which has poor surface drainage. Consequently, the region has a dense network of temporary rivers, the major exception being the São Francisco River, which is perennial. The groundwater of the crystalline formation has predominantly elevated salt levels and low flow wells (in the order of 1 m³/h). The exception occurs in sedimentary formations, where the water is generally of better quality and where it is possible to exploit flows of the order of tens to hundreds of m³/h, continuously.⁶¹



Source: Demetrio et al. (2007)

Figure 15 Distribution of sedimentary and crystalline rocks occurring in the area within the Semiarid⁶²

There are inequalities in access to supply services of quality water and sewage. Only about 31% of the rural municipalities in the Northeast are connected to the water distribution network.⁶³ In addition to lack of access to water, there are serious concerns regarding the quality of the water that can be accessed. The National Sanitation Information System (SNIS) shows, for the year of 2015, that about 27% of all the population in the Northeast still has no access to treated water.⁶⁴ This number is undoubtedly much higher amongst rural households in the Semiarid region. The main water access policy aims at increasing household water storage capacity through the use of cisterns, which are primarily fed by rainwater capture or water trucks (please see the section 3.2.1 for more details on government policies and programs).

Alternative forms of water supply, predominant in rural areas, face one or more of the following challenges: not meeting the quality standards defined in the legislation, lacking internal channeling in residence, receiving

⁶¹ CIRILO, J. A. Public water resources policy for the semiarid region. *Estudos Avançados*, v. 22, n. 63, p. 61 - 82, 2008.

⁶² DEMETRIO, J. G. A.; FEITOSA, E. C.; SARAIVA, A. L. Aquíferos fissurais. In: CIRILO, J. A.; CABRAL, J. J., et al (Ed.). *O uso sustentável dos recursos hídricos em regiões semiáridas*. Recife, PE: Editora da UFPE, 2007. p.105 - 132.

⁶³ IBGE, 2010.

⁶⁴ INSTITUTO-TRATA-BRASIL. *Acesso à água nas regiões Norte e Nordeste do Brasil: desafios e perspectivas*. São Paulo: Instituto Trata Brasil, 186 p., 2018. Available at: http://tratabrasil.org.br/images/estudos/acesso-agua/tratabrasil_relatorio_v3_A.pdf.

intermittent supplies and having insufficient amounts. There are public health implications arising from the consumption of unsafe water supplied by inadequate solutions.⁶⁵

A study carried out by the National Water Agency (ANA) shows climate change will aggravate the situation intensifying aridity conditions in the semiarid region.⁶⁶ The depletion of water reservoirs due to the marked evaporation present in the region is expected to accentuate with climate change. Studies have shown that 40% of the water in a small reservoir is lost to the atmosphere by evaporation, which in the region often exceeds 2000 mm/year, in some cases reaching 3000 mm/year⁶⁷⁻⁶⁸. The intense evaporation causes salinization of the stored water.⁶⁹ The recent severe drought has reduced the water stored in reservoirs in the Northeast by approximately 43% in volume from May 2012 to May 2017⁷⁰. As can be seen in figure 17, the projected water balance (considering precipitation and evaporation) is expected to be negative in the next few decades⁷¹. This reality will have a direct consequence on groundwater availability, which is projected to suffer a reduction in recharge rates of up to 70% by 2050.⁷²

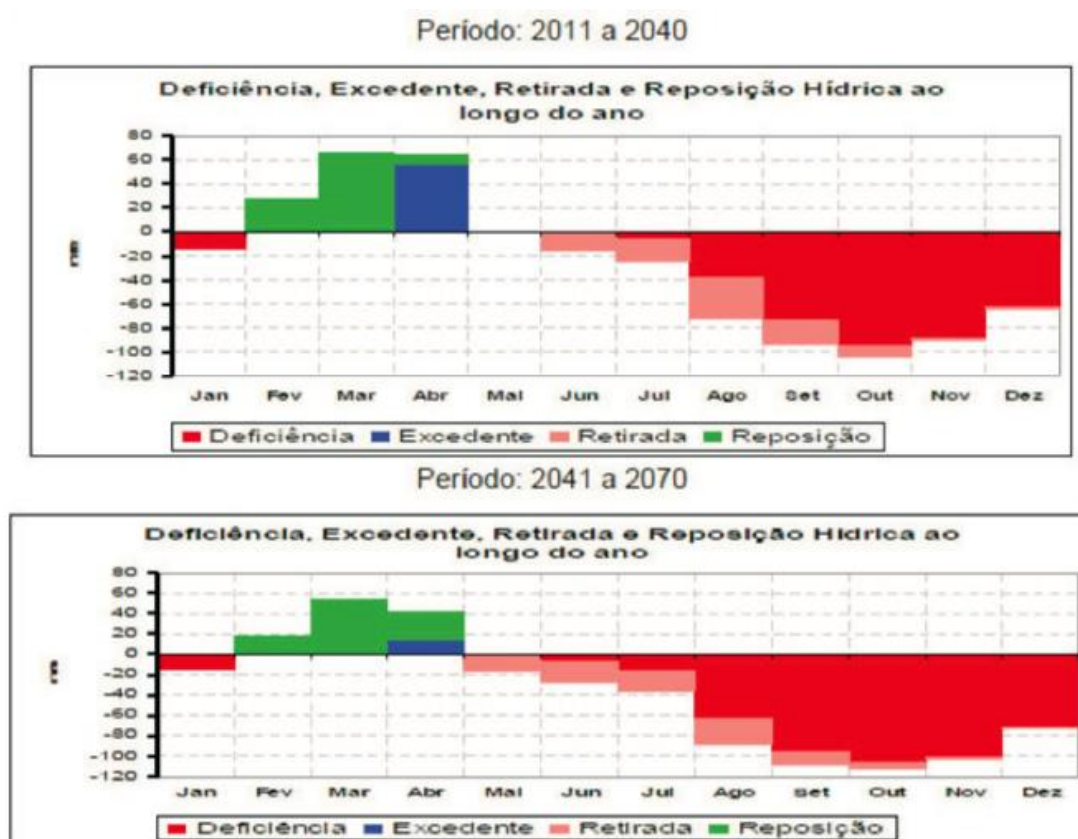


Figure 16 Projected Water Balance for the Northeast (red: deficient, blue: exceeding, pink: withdrawal, green: recharge)⁷³

⁶⁵ Instituto Trata Brasil (2018), as above.

⁶⁶ ANA; CGEE, Mudanças Climáticas e Recursos Hídricos (2016), as above.

⁶⁷ MOURA, M. S. B. D. et al. Clima e água de chuva no Semi-Árido. In: BRITO, L. T. D. L.; MOURA, M. S. B. D., et al (Ed.). **Potencialidades da água de chuva no Semi-Árido brasileiro**. Petrolina, PE: Embrapa Semi-Árido, 2007. p. 37 - 59.

⁶⁸ MOLLE, F. **Perdas por evaporação e infiltração em pequenos açudes**. Recife: SUDENE/DPG/PRN/GT.HME, 1989. 175 p.

⁶⁹ For instance, the installation of flushing devices at the bottom of reservoirs can extract salinized water deposits at the end of the dry periods, which creates adequate conditions for the accumulation of fresh water during the next rainy season. The same operating scheme could transform a salinized well water into fresh water by pumping the residual salinized water at the end of the dry season.

⁷⁰ GONDIM, J. et al. A seca atual no Semiárido nordestino – Impactos sobre os recursos hídricos. **Parcerias Estratégicas**, v. 22, n. 44, p. 277 - 300, 2017.

⁷¹ NOBRE, P. et al. Impactos de mudanças climáticas globais na hidrologia do semiárido do Nordeste brasileiro para o final do século XXI. In: MEDEIROS, S. D. S.; GHEYI, H. R., et al (Ed.). **Recursos hídricos em regiões áridas e semiáridas**. Campina Grande, PB: INSA, 2011. p. 423 - 439.

⁷² ANA; CGEE, Mudanças Climáticas e Recursos Hídricos, 2016.

⁷³ NOBRE, P. et al. Impactos de mudanças climáticas globais na hidrologia do semiárido do Nordeste brasileiro para o final do século XXI. In: MEDEIROS, S. D. S.; GHEYI, H. R., et al (Ed.). **Recursos hídricos em regiões áridas e semiáridas**. Campina Grande, PB: INSA, 2011. p. 423 - 439, 2011.

2.4.3 Inadequate agricultural practices

Agricultural systems of the Semi-arid region evolved with the intensification of productive units, which is related to the increase of the density of the land occupation, the growth of the herds and the spread of private appropriation of once open grazing lands. This process calls for innovation, as many of the usual agricultural practices become increasingly inadequate.

Ill-suited soil preparation techniques accentuate degradation processes in a soil that is already shallow, vulnerable to erosion, and with a thin layer of organic matter, which further restricts water retention capacity. Fire is still used to prepare for planting, further accelerating land degradation and desertification processes as well as emitting carbon to the atmosphere. This practice is part of the swidden agriculture (also known as slash-and-burn agriculture) that farmers have traditionally used in tropical regions for centuries.⁷⁴ Itinerant agriculture prepares plots in the traditional slash and burn, with cleared areas used for two or three years and then abandoned, with cultivation moving on to other areas opened for planting new crops. Today, constraints on space are forcibly extending the length of time these areas must be used for farming purposes, thus rendering the system to become dysfunctional in Semi-arid Northeastern Brazil.⁷⁵

Historically, periodic droughts, soil limitations, and other environmental constraints did not allow the establishment of intensive agriculture. The region has been more suitable for animal grazing instead. Raising ruminants has been the main activity in the Semi-arid ever since colonial times. Rearing goats, sheep and cattle are still the main productive activities for the majority of the region's farms.⁷⁶ Currently, about 19% of the overall national cattle herd, 50% of the sheep herd, and 90% of the goatherds in Brazil raise in the Northeast. Traditionally, the natural *Caatinga* vegetation of the semi-arid region furnishes the staple food consumed by goats and sheep.

As forage supplies from the *Caatinga* shrink steadily during the dry season, farmers are raising livestock using waste biomass from their food-crop plots as additional food sources for their herds. Recently, farmers are planting fodder crops to boost overall livestock production. Noteworthy amongst the fodder crops is the *palma forrageira* cactus⁷⁷, a small set of cactus species brought from Mexico that flourishes in the region. In areas with more water availability grasses and sugarcane were planted for forage. In the '90s, rural technical assistance and cheap credit were the incentives used to disseminate a new practice: planting trample-resistant herbs (very often buffel grass⁷⁸). Nevertheless, the combination of on-going use with heavy grazing pressure under limited rainfall conditions has resulted in many of these areas becoming severely degraded, despite these species being reasonably drought-resistant.⁷⁹ Fodder processing and conservation, such as silage and, to a lesser extent, haymaking, are other new practices that are gradually spreading in the region.

It is also worth recalling that the availability of drinking water for livestock⁸⁰ is a crucial element for these herds. Water sources are scarce, as discussed previously, and farmers invest in installing drinking ponds, waterholes, boring wells, digging pits and constructing weirs and cisterns⁸¹. However, this problem – which becomes crucial during dry seasons – is far from being solved and is being aggravated by climate change.

Despite the recent innovations in fodder plantations and storage mentioned above, the grazing system is still predominantly extensive, with overgrazing as the dominant factor. Extensive animal husbandry limits the return of nutrients to the soil, as herds are left loose to pasture and plots receive manure irregularly and in low

⁷⁴ ASHTON, M. S.; KELTY, M. J. **The Practice of Silviculture: Applied Forest Ecology**. Hoboken, NJ: John Wiley & Sons, 776 p., 2018.

⁷⁵ In this system, the natural forest vegetation is cut and burned, and a crop such as maize or beans is grown for two or three cycles, and then the area is left fallow. Forest vegetation is allowed to develop, and soil nutrient stocks build up. Food is grown on alternate plots until the fallow site has been restored to a condition suitable for clearing and cropping again. Fallow periods vary depending on available land, but family units are getting smaller and smaller and thus fallow periods must be shortened to the point where they no longer serve their purpose, soil rapidly degrades, and agricultural yields decline.

⁷⁶ Studies show that families add together a variety of sources in order to constitute total family incomes. But even for families leaning heavily on agricultural output, this never outstrips the weight of livestock production, in terms of gross value produced. (HOLANDA JR., E. V. et al. *Tipologia e estrutura da renda de caprino-ovinocultores de base familiar no Sertão Baiano do São Francisco*. VI Encontro da Sociedade Brasileira de Sistemas de Produção, 2004. Aracaju, SE. Sociedade Brasileira de Sistemas de Produção, 20 a 22 de outubro de 2004).

⁷⁷ Mainly *Opuntia ficus-indica*, and also *Nopalea cochenilifera*.

⁷⁸ *Cenchrus ciliaris* L.

⁷⁹ OLIVEIRA, M. C. **Capim buffel: Produção e manejo nas regiões secas do Nordeste**. Petrolina: EMBRAPA/CPATSA, 1993.

⁸⁰ It is worth recalling that a goat or sheep drinks between two and six litres of water a day. A hundred-head herd thus requires considerable amounts of water each day. (ARAÚJO, G. G. L. et al. *A água nos sistemas de produção de caprinos e ovinos*. In: VOLTOLINI, T. V. (Ed.). **Produção de caprinos e ovinos no Semiárido**. Petrolina: Embrapa Semiárido, p.69-93, 2011).

⁸¹ ARAÚJO FILHO, J. A. **Manejo pastoril sustentável da caatinga**. Recife, PE: Projeto Dom Helder Camara, 200 p., 2013.

quantities. Additionally, the large land requirements of low-yield, extensive systems limit the habitat available for wild species. Overgrazing causes the increase of bare soil that facilitates water and wind erosion, accelerating the desertification process.⁸²

The climate change projections of increasing temperatures and irregular rainfall in addition to the current the inherent fragile conditions of the soil, the increasingly smaller family units, the constant drive to production intensification and the application of inadequate practices translate into a decline in productivity, of both crops and animal husbandry. Production systems in the semiarid region, the way they are conducted, are in crisis and feed into environmental degradation processes, which further aggravate with changing climate conditions. This situation induces the impoverishment of farming families and thus forming a vicious circle of poverty and vulnerability to climate change.

2.4.4 Deforestation and degradation of natural vegetation remnants

The *Caatinga* (as the natural vegetation of the semiarid region is called) is the predominant ecosystem in the Semiarid, covering approximately 11% of the national territory. The word *Caatinga* means white forest in Tupi language and refers to the small-leaved, medium to tall, dry, light forests dominated by woody genera. The *Caatinga* vegetation of trees and bushes native to these regions, are predominantly xerophytic or drought-resistant and thus adapted to the limited water availability characteristic of Northeast Brazil. The Ministry of the Environment estimated that the *Caatinga* was deforested at a rate of 0.28% per year (2,352 km²/yr.) between 2002 and 2008, comparable to the deforestation rate in the Amazon, emitting large quantities of carbon to the atmosphere. In 2010, little more than half (53.6%) of the original vegetal cover remained⁸³, the rest having been altered by human activities, i.e., transformed into pasture, agricultural land, roads, houses, villages, and towns.

What remains of the natural ecosystems of the *Caatinga* is highly fragmented and degraded. Today the vegetation is a mostly open scrub forest. The gallery forests and dry forests have been replaced mainly by open vegetation formations.⁸⁴

According to the United Nations Conference to Combat Desertification (UNCCD), when land degradation happens in the world's drylands, it often creates desert-like conditions. Land degradation occurs everywhere but is defined as desertification when it occurs in the drylands, resulting from various factors, including climatic variations and human activities.⁸⁵ Researchers have noted that more than 50% of the Brazilian semiarid is already in the process of desertification and 94% of the Northeast region of Brazil is under moderate to high susceptibility to it, as can be seen in figure 18.⁸⁶

Climate change and desertification remain inextricably linked because of feedbacks between land degradation and precipitation. Given these projections of future climate change in the region, there will be increased land degradation owing to droughts and increased soil erosion due to heavy rainfall events. The project must also consider other causes of desertification in the region as deforestation for fuelwood production, the exploitation of clay deposits⁸⁷, cattle raising, mining and over-cultivation.⁸⁸

⁸² KRÖPFL, A. I. et al. Degradation and recovery processes in Semiarid patchy range-lands of northern Patagonia, Argentina. **Land Degradation and Development**, v. 24, n. 4, p. 393 – 399, 2013. Retrieved at: https://www.researchgate.net/publication/264700366_Degradation_and_recovery_processes_in_Semiarid_patchy_rangelands_of_northern_Patagonia_Argentina.

⁸³ BRASIL-MMA. **Monitoramento por Satélite do Desmatamento no Bioma Caatinga**. Brasília: MMA, 8 p., 2010. Available at: http://www.mma.gov.br/estruturas/203/_arquivos/cartilha_monitoramento_caatinga_203.pdf.

⁸⁴ GIOVANNI, M.A. and VENTICINQUE, E.M. **Fragmentation patterns of the Caatinga drylands**. *Landscape Ecology*. August 2018, Volume 33, Issue 8, pp 1353–1367

⁸⁵ United Nations Convention to Combat Desertification (UNCCD) United Nations Convention to combat desertification in countries experiencing serious drought and/or desertification, particularly in Africa. Bonn: UNCCD, 1994. Available at: https://www.tarimorman.gov.tr/CEM/Belgeler/collesme%20belgeleri%20arsiv/Sayfa04/S%C3%B6zle%C5%9Fmeler/UNCCD_Eng_1.pdf.

⁸⁶ VIEIRA, R. D. S. P. et al. Identifying areas susceptible to desertification in the Brazilian Northeast. **Solid Earth**, v. 6, p. 347 – 360, 2015. Retrieved at: <https://www.solid-earth.net/6/347/2015/se-6-347-2015.pdf>.

⁸⁷ In the Northeast, firewood represents about 30% of its energy matrix, it is used not only to supply the gypsum and ceramic industries in the semiarid, but also the steel industry in the states of Minas Gerais and Espírito Santo. Logging is one of the main economic activities in the semiarid, employing around 700 thousand people. However, 94% of the biomass available in the market has been unsustainably or illegally extracted from the *Caatinga*. (BRASIL-MMA, 2010, as in foot-note 66 above)

⁸⁸ CGEE. **Desertificação, degradação da terra e secas no Brasil**. Brasília: Centro de Gestão e Estudos Estratégicos – CGEE, 252 p., 2016.

Desertification, a consequence of a combination of human factors and climate change, results in reduction of the natural fertility of soils, salinization and alkalization of soils and water, decreased water availability, impoverished and heavily impacted biodiversity, decreased ecosystem resilience capacity, all of which, in turn, affect the health and livelihood of local population.⁸⁹

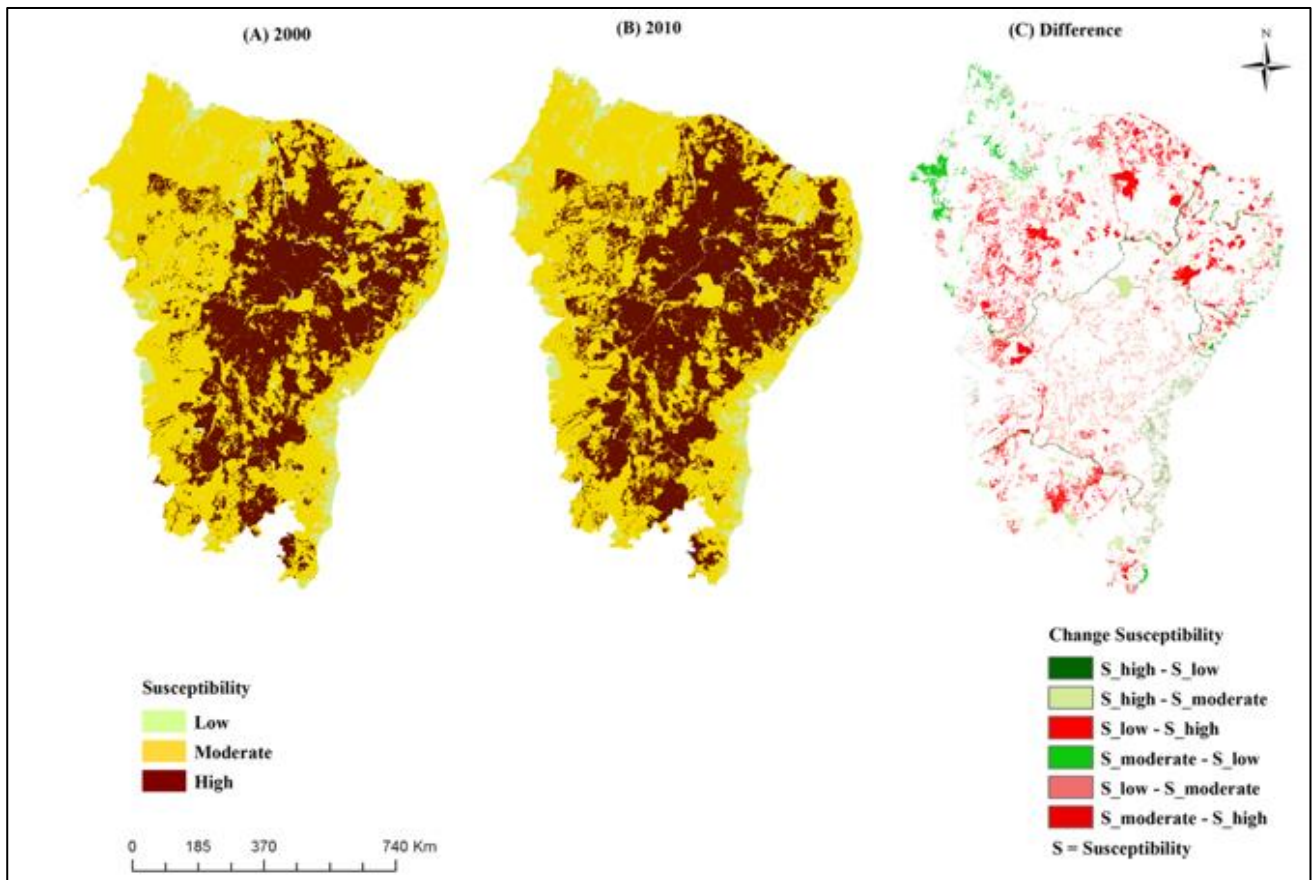


Figure 17 Areas Susceptible to Desertification in the Brazilian Semiarid Region for both 2000 and 2010, as well as the Changes that Occurred between these Periods⁹⁰

⁸⁹ CGEE, 2016, as in foot-note 68 above.

⁹⁰ VIEIRA, R. D. S. P. et al. Identifying areas susceptible to desertification in the Brazilian Northeast. **Solid Earth**, v. 6, p. 347 – 360, 2015. Retrieved at: <https://www.solid-earth.net/6/347/2015/se-6-347-2015.pdf>.

3. BASELINE SCENARIO: BARRIERS THAT NEED TO BE OVERCOME

Based on the sources of vulnerability discussed above, the livelihoods of the semiarid region family farmers are under severe stress due to the combination of climate change pressures and historical degradation of the ecological and productive functions agroecosystems. This situation will aggravate due to regional effects of climate change, such as increases in maximum temperature and diminishing precipitation, more significant rainfall variability, more severe and frequent droughts, pointing towards a possible collapse of farming systems, that will significantly worsen environmental degradation, increase food and water insecurity, leading to an acute crisis in the livelihoods of this population.

Several barriers reinforce the *status quo* of unsustainability, which must be overcome to pave the way for the transformation that will help overcome the vulnerabilities. An analysis of the problems and trends apparent in these farming systems shows that many of the current practices are not sustainable, even over the medium and short term. Instead, many of these practices make systems even more vulnerable, threatening the livelihoods of families that depend on them, particularly considering climate change scenarios. There is an urgent need for sweeping changes in the stewardship of semiarid farming systems in Northeast Brazil, helping these communities to adapt to foreseen future conditions and to become more resilient.

The question arises of why these farmers continue to use unsustainable practices. Some barriers that hamper the implementation of the needed changes in practice towards adaptation and greater resilience are listed below.

3.1.1 Reduced knowledge on Climate Resilient Productive Systems (CRPS)

Practices that enhance resilience and adaptation to climate change are sparse. Farmers, technical assistance services and even researchers firmly believed that ‘modern’ dryland agriculture in these semiarid was not possible, except for a few specific areas where local conditions were more favorable. Successive harvest losses led to genetic erosion of traditional crop species, with a shrinking availability of seeds adapted to the harsh conditions in these regions.

Efforts have been made for quite some time to intensify livestock systems, principally through bolstering fodder production. The introduction of crops such as *palma* forage cactus and buffel-grass are good examples of this. But these two cases – although intended to increase output and productivity – instead were planted as monocultures, simplifying the system and heightening risks, leading to less resilience. Farmers were encouraged to clear the *Caatinga* to establish single-crop grazing lands.

Recently, some productive systems offering greater resilience and better adaptation to climate change have been tried out successfully, although the dissemination of this information is limited. Worthy of mention are the practices put forth by the Goats and Sheep Research Centre at the Brazilian Agricultural Research Enterprise (EMBRAPA) which proposes a system that blends crops, forestry, and livestock⁹¹, and the agroecological consortia– a proposal promoted by the IFAD financed Dom Helder Camara Project – which has been spreading slowly over various parts of the semiarid. However, these have not been absorbed yet by the mainstream technical assistance providers, and implementation examples are few and far between, with limited contact among them. It is necessary to scale up these examples, multiply and regionalize the climate-resilient agricultural models available.

3.1.2 Low investment capacity and physical labor availability

Many innovative approaches that increase resilience to climate change are expensive, requiring financial investment and much labor. However, families in this region do not have the necessary funds available (see vulnerability in section 2.4). Furthermore, the demographic dynamics in the region are such that young people are departing, leaving behind an aging population – which means that, in so many cases, the family workforce is also thinning out. The hard-physical labor necessary is another factor explaining the limited availability of options.

⁹¹ ARAÚJO FILHO, J. A. Manejo pastoril sustentável da caatinga. Recife, PE: Projeto Dom Helder Camara, 2013. 200 p.

A transition in modes of production is not immediate, and it requires that the involved families need to be patient before they can reap tangible results, a situation that differs from the logic that governs standardized interventions in the context of conventional agriculture. Especially at the beginning of the implementation of a climate-resilient productive system, families may find it difficult to 'believe' in the chosen course. Therefore, it is essential that the resilient systems' implementation is coupled with a dynamic monitoring system that can reveal some impacts linked to indicators in the short term. Participating in exchange networks with the presence of farmers that are more advanced in climate-resilient practices is also an incentive for those who wish to shift their production models.

3.1.3 Aging and masculinization of rural population

The population of the semiarid northeastern region has aged when comparing data from 2000 to the 2010 Census, reducing the proportion of people under 15 years old and significantly increasing the percentage of people over 60 years old. The ratio of young people in the total population decreased from 33% to 26.5%, at the same time as the proportion of people over 60 reached 10.3%, compared to 8.4% in 2000.

Youth exodus to urban areas intensifies the aging of the rural population. The largest gap migrations occur for the population ranging from 16 to 35 years of age. Whereas in 1991, no northeastern municipality presented a rural population aging index⁹² above 20%, in 2010 indices above 25% were found in most rural towns in the region.⁹³

Another important dimension of analysis of the selective exodus is the masculinization of the rural population. In rural areas, the male population is higher than the female population in all age groups. This female exodus is attributed to traditional labor division, exclusion of women from land inheritance, lack of perspective in the job market and because females obtain higher educational degrees than males in rural regions.⁹⁴

It is necessary to engage youth (with a focus on women) to overcome this challenge, making the agricultural activity interesting and intellectually challenging. Developing mechanical tools that facilitate work and save labor will make agricultural activities lighter and more pleasurable. Engaging the entire family in collective mobilization mechanisms, such as *mutirões*⁹⁵ that provide dynamics of mutual aid between families, is a way to alleviate the burden of manual labor and to foster intergenerational interaction.

3.1.4 The limited capacity of collective action among family farmers

The rural community can be characterized by the existence of an area or territory, a sense of belonging, and a system of social institutions that organize local life. These include family relationships, proximity networks and reciprocity mechanisms (including joint efforts - *mutirões*). These mechanisms allowed the performance of various types of collective action, the management of shared resources, as well as the holding of community parties, organization of religious events, etc. But it is common to hear that traditional communities are 'disorganized'. This expression does not correspond entirely to reality. On the other hand, these structures do not work equally well in all communities, and, in some cases, the farmers themselves claim that there is a significant 'erosion' of traditions.

The ancestral mechanisms that organized communities no longer meet all the demands of families' activities and the actions of other social actors with whom communities establish relationships. Therefore, they have resorted to new forms of organization, these include community associations, unions of rural workers, cooperatives and municipal or regional associations. But it is worth questioning the efficiency of these new entities in terms of their ability to organize collective action for sustainable development.

One of the barriers that reinforce the status quo of unsustainability, mentioned earlier, involves the role of 'community associations' as an effective means of representing and organizing collective action at the local level. Regarding the specific issues of women, youth and ethnic groups, they are often not sufficiently

⁹² This index measures the ratio between the elderly aged 65 and over and the young population aged 17 years or less.

⁹³ MAIA, A. G.; BUAINAIN, A. M. O novo mapa da população rural brasileira. *Confins*, v. 2015, n. 25, p. 1 - 25, 2015.

⁹⁴ As in footnote above.

⁹⁵ Collective mobilization process for mutual assistance of a free character, especially between neighbouring farming families, for preparing fields, harvesting, building a house, etc.

represented among the full range of community demands and are often marginalized. At the same time, the governance mechanisms of these associations are often flawed, leading to situations in which leadership roles/positions remain for long periods in the hands of a person or a tiny group of members who are not necessarily the most capable or suitable for the task. Due to these factors, most existing community associations will need support, especially in terms of capacity building, if they are to be, in the context of Project implementation, an efficient tool for implementing climate resilience initiatives.

Mobilizing multiple families from the same region in *mutirões* (see the previous section) could be a fruitful mechanism for promoting (or reactivating) horizontal cooperation and collective action at the local (mainly community) level. These practices are also fundamental because they favor social inclusion, strengthening the active participation of women and youth in family units and the exchange of knowledge and practices through joint efforts and exchanges. A "revival" of this traditional practice could have a beneficial effect on community associations.

It is also important to mention organizations that bring together farmers at a supra-Community level. Rural Workers Unions (STRs) are structured at the municipality level. They are present in practically the entire semiarid region. But the trajectory of these organizations has made them deal with issues such as rural pensions. Although there were some examples in the 1990s of STRs that embraced the cause of agroecological peasant production, this strand was virtually extinguished in the 2000s.

Finally, it is worth mentioning cooperatives. There was, at a certain period of the last century, very significant proliferation of these throughout Brazil. But the northeastern cooperatives had many problems. On the one hand, they took in a tiny portion of family farming. On the other hand, the scarce mobilization of cooperative members, coupled with poor management, has caused many of these cooperatives to fail. Although there is a timid process of resumption, the presence of cooperatives in the semiarid region is lower today than in the other areas of Brazil.

3.1.5 Difficult market and capital access

Family farmers in the semiarid region find it hard to sell their products on the market, a fact that discourages investment and innovation. These difficulties may derive from the widely dispersed and reduced scales at which individual farmers work as well as the problem of meeting requirements for marketing products (such as state or federal legislation), thus demanding a higher level of organization.

Public health regulations were developed considering agroindustry models and are extremely difficult to implement for small homemade food items, hampering the latter's access to the market.⁹⁶ Many of the products that must comply with stringent health regulation processes (such as jellies, cookies and dairy products) are produced mainly by women since they tend to engage more actively in processing stages within the productive arrangements. National regulation recognizes that food products express cultural identities, revealing traditional know-how, in addition to cultivating a relationship with the natural resource base and regional biodiversity, and thus, there is a need to preserve the artisanal characteristics of food.⁹⁷ In practice, each state must develop regulations, and few are those that have done this.

Considering these hurdles, a starting point would be the construction of strategies for the legitimization of traditional products. A viable alternative involves the stimulation of short production circuits, characterized in terms of the approximation between production and consumption and guided by aspects such as trust, quality, transparency and locality. Another measure involves the encouragement of cooperatives, which make it possible to simplify procedures and adapt them to the technical, cultural and socioeconomic conditions of small-scale productions.

Government food purchasing policies (mainly the PAA Food Security Program and the PNAE School Meals Program, see section 3.2.1 below for more details) opened up market access channels that have been widely

⁹⁶ The National Health Surveillance Agency (ANVISA), linked to the Ministry of Health and corresponding state agencies, has strict standards. Animal products, including honey, must comply with federal standards as defined in the Federal Inspection System (SIF). There are also State Inspection Systems (SIE) and Municipal Inspection Systems (SIM) and an attempt to integrate them into a single system of attention to agricultural health standards (SUASA).

⁹⁷ RDC No. 49/2013, in which there is a guideline that aims to "protect artisanal production in order to preserve traditional customs, habits and knowledge, in the perspective of multiculturalism of peoples, traditional communities and family farmers."

used by family farmers. However, these policies have been cut back very significantly since 2014 due to the economic crisis, thus hampering market access for this segment. It will be necessary to strengthen other alternatives that don't require public support, such as local and regional fairs, online sales, and public-private partnerships. Short marketing circuits such as local markets or fairs are favorable to social inclusion, insofar as they favor the direct participation of women, who tend to be very active in these spaces, and to strengthen the processes of sociability and spontaneous processes of learning and to enable a closer rural-urban relationship.

3.1.6 Deforestation 'incentive'

Although it doesn't have this intention, the provision of credit and conventional technical assistance for the implementation of pastures in monoculture has, in practice, acted as an incentive for deforestation. The establishment of this type of pasture is generally viewed as a factor that increases the value of the land when compared to the value of an area with the natural habitat, thus promoting the elimination of the *Caatinga*.

Besides, firewood and charcoal for industrial and commercial purposes constitute the most important demand for wood products from the *Caatinga*. Official estimates indicate that these activities consume 25.1 million esters/year⁹⁸. This demand cannot be met from current areas under a sustainable forest management regime. Approximately 2.5 million ha are needed to meet the current demand for wood products, but only 94,000 ha were under a sustainable management regime in 2010 (which produced 1.5 million esters/year). This implies that 94% of the wood and charcoal in the market comes from unsustainable logging, whether authorized or not.

The abundant supply of firewood and charcoal from deforestation keeps wood and charcoal at low prices and prevents the widespread adoption of mechanisms that promote sustainable use and management of the *Caatinga*.⁹⁹ This is important, as Sustainable Forestry Management Plans (PMFS in Portuguese) requires landowners to comply with formal obligations (e.g., annual reports, payment of fees) and cumbersome procedures.

It is necessary to create a 'forestry-friendly culture' in which sustainable forest management is perceived as a productive activity that deserves careful planning and organized management. Integrating forest management with agricultural activities can generate more jobs and diversify the household's income.

3.1.7 Key challenge

The climate stressors and the vulnerability sources aggravate the negative cycle caused by the inadequate practices and the barriers mentioned above. This process translates into a decline in productivity, of both crops and animal husbandry. Production systems in the semiarid region are in crisis and feed into social and environmental degradation processes, which induces the impoverishment of farming families and ecosystem services.

3.2 Existing public policies, strategies and projects/programs

The federal government has several policies and programs that try to tackle the vulnerability sources described above. The main ones are described in the following paragraphs. At the end of this section, we will also briefly present other existing policies and projects/programs.

⁹⁸ GARIGLIO, M. A. et al., Eds. *Uso Sustentável e Conservação dos Recursos Florestais da Caatinga*. Brasília: Serviço Florestal Brasileiro, p.368 ed. 2010. Available at: http://www.mma.gov.br/estruturas/sfb/arquivos/web_uso_sustentvel_e_conservao_dos_recursos_florestais_da_caatinga_95.pdf.

⁹⁹ Like the Sustainable Forestry Management Plans (Planos de Manejo Florestal Sustentáveis [PMFS]) created in the 90's by IBAMA (executive organ of the National Environment Policy) with support by international cooperation agencies like UNDP and FAO.

3.2.1 Poverty Reduction and Family Farming

The most prominent poverty reduction program is *Bolsa Família*, a conditional cash transfer program created Federal Government in 2004. It consists of financial assistance to poor families with pregnant women, children and teens between 0 and 17 years old with extremely poor per capita income.¹⁰⁰ The Program has three main axes: (a) income transfer to promote immediate poverty alleviation; (b) conditions that reinforce access to fundamental social rights in education, health, and social assistance; (c) and complementary programs to strengthen families, so the beneficiaries can overcome their social vulnerabilities.

The National Program for Strengthening Family Farming (PRONAF) was launched in 1996. In 2003 it was transformed to finance investments and current spending loans for individual or groups of family farmers in seventeen different modalities, including specific credit lines for women and youth. The program operates through public banks, with the Bank of the Northeast (*Banco do Nordeste – BNB*) being the chief financial agent in the Northeastern region. The program budget in 2017 was R\$ 27 billion to finance investments and short-term loans for family farmers.

In addition to *Bolsa Família* and PRONAF, other relevant programs which target family farmers include:

- a. the Agrarian Reform Program (*Programa Nacional da Reforma Agrária - PNRA*), under the responsibility of the National Institute for Colonization (INCRA), settles and registers families claiming land in the Unified Registration (*Cadastro Único*);
- b. the Agrarian Credit Program (*Programa do Crédito Fundiário – PCF*), a credit program that allows rural farmers to acquire their land to combating rural poverty and strengthen family farming;
- c. the Harvest Guarantee (*Garantia Safra*) Program, which enables families to receive a compensation in case of loss of harvest due to persistent drought or excess of rains;
- d. the Family Agriculture Price Guarantee Program (*Programa de Garantia de Preço da Agricultura Familiar - PGPAF*), which sets minimum prices for the main products of family agriculture;
- e. Proagro Plus Insurance (*Seguro Proagro Mais*) which protects credit takers of PRONAF in case of harvest loss. It is multi-risk insurance, covering losses due to climatic adversities and diseases or pests while recognizing traditional production methods of family farmers, such as intercropping, traditional, local or creole cultivars.
- f. Food Purchase Program (*Programa de Aquisição de Alimentos – PAA*) creates an institutional market for products produced by family farmers and their organizations through a bidding system. The acquired products are donated to social institutions (hospitals, care institutions, schools) and people in situations of food and nutritional insecurity (who receive food baskets), or destined to the formation of public stocks.
- g. National School Meal Program (*Programa Nacional de Alimentação Escolar – PNAE*), requires that at least 30% of resources spent on school meals go to family farmers and cooperatives, and works with simplified procurement processes.

Other credit programs, not necessarily oriented for family farmers, but that may also be available to them are:

- i) ABC Program for investments to reduce CO₂ emissions in agriculture;
- ii) Agriculture Modernization and Natural Resource Conservation Program¹⁰¹;
- iii) Promotion of Technological innovation in agricultural production Program¹⁰²;
- iv) Program for Building and Expansion of Storage Infrastructure¹⁰³;
- v) Agricultural Machinery Modernization Program¹⁰⁴;
- vi) Incentives for Irrigation and Greenhouse Production Program¹⁰⁵; and
- vii) Other credit lines for Cooperatives. The Bank of Brazil and BNDES are the main financial agents in the public sector and usually provide funds for some of the Programs and credit lines already mentioned. As mentioned above, the Banco do Nordeste is also an active financial agent in the northeastern region.

¹⁰⁰ Extremely poor households are defined by a monthly per capita revenue between R\$89 up to R\$178.

¹⁰¹ Programa de Modernização da Agricultura e Conservação de Recursos Naturais – Moderagro.

¹⁰² Programa de Incentivo à Inovação Tecnológica na Produção Agropecuária – Inovagro.

¹⁰³ Programa para Construção e Ampliação de Armazéns – PCA.

¹⁰⁴ Programa de Modernização da Frota de Tratores Agrícolas e Implementos Associados e Colheiteiras – Moderfrota.

¹⁰⁵ Programa de Incentivo à Irrigação e à Produção em Ambiente Protegido – Moderinfra.

To stimulate the production and consumption of native products, the federal government launched the National Plan to promote Socio-Biodiversity Supply Chains¹⁰⁶ and the Policy to Guarantee Minimum prices for Socio-biodiversity Products.¹⁰⁷ These programs identified 17 species used by gatherers (the so-called ‘extractivist’) communities from several biomes and guarantee a minimum value when the market price is lower than the minimum price established by the National Supply Company (*Companhia Nacional de Abastecimento – CONAB*).

3.2.2 Food and Nutrition Security

The Project is consistently aligned with the main policies and priorities for food and nutrition security at the national level.

The National Plan for Food and Nutrition Security (*Plano Nacional de Segurança Alimentar e Nutricional – PLANSAN*) is the main instrument of the Brazilian National Policy on Food and Nutrition Security.¹⁰⁸ The Plan summarizes the proposed actions to be taken by the federal government to respect, protect, promote and guarantee the right to adequate food to all Brazilians. The PLANSAN is guided by the National Policy on Food and Nutrition Security (PNSAN) and is built in an inter-sectoral manner by the Inter-ministerial Chamber of Food Security and Nutrition (CAISAN), that includes 21 ministries, on the basis of the priorities established by the National Council for Food and Nutrition Security (*Conselho Nacional de Segurança Alimentar e Nutricional – CONSEA*). Building on the achievements of the first Plan and especially on its multisector approach, the PLANSAN II enhances its focus on key issues, such as: strengthening of agroecological food systems; supporting indigenous peoples and traditional communities’ access to public policies, especially those related to family farming; increasing the public purchase of food products from family farming – by strengthening PNAE and PAA; recognizing the significant contribution of women in agriculture and family farming, especially in the conservation of natural resources, and enhancing their access to public policies and; strong concern for availability of safe and clean water, including the revitalization of watersheds and springs.

3.2.3 Indigenous Peoples and traditional communities

Established in 2007, the National Policy for the Sustainable Development of Traditional Peoples and Communities (*Política Nacional de Desenvolvimento Sustentável dos Povos e Comunidades Tradicionais – PNPCT*) seeks to promote the sustainable development of traditional peoples and their communities, including indigenous peoples. One of the leading implementation tools of the PNPCT is the Sustainable Development Plan, which aims to inform and guide the implementation of the Policy. In 2012, the Brazilian government launched the National Policy for Environmental and Territorial Management of Indigenous Lands (*Política Nacional de Gestão Territorial e Ambiental de Terras Indígenas – PNGATI*). The Policy calls for the environmental protection and full participation of indigenous peoples in all processes that affect their lands, stressing the need to request and obtain indigenous people free, prior and informed consent (FPIC) before taking any actions in indigenous territories. The policy also provides for the participation of representatives of indigenous peoples in institutions in charge of regional and national environmental policies that affect their territories.

3.2.4 Water Access

As explained above, the semiarid northeastern region has age-old water scarcity problems that have been addressed, to a greater or lesser extent, by several government programs and policies. A major infrastructure project, which is still being implemented, is the transposition of the São Francisco River, which started in 2007 and parts of which started in 2017. This project will divert water from the San Francisco River to benefit 12 million people in four northeastern states.

Both the One Million Cisterns Program by MDS and the Freshwater Program by MMA are billed to be strategic partners in this Project. The Cisterns Program, financed by the Ministry of Social Development (MDS) since 2003, targets low-income rural families, affected by drought or lack of water, and residing mainly in the

¹⁰⁶ National Plan for the Promotion of Socio-Biodiversity Product Chains.

¹⁰⁷ Minimum Price Policy for Socio-Biodiversity Products.

¹⁰⁸ Established by Decree no.7.272 / 2010. PLANSAN I (2012-2015) was launched in 2015, followed by PLANSAN II (2016-2019).

semiarid region. The program currently supports the deployment of more than 15 different types of ‘social technologies’¹⁰⁹. Since its creation, more than 1 million water ‘social technologies’ have been implemented with Program support, including 877 thousand plate cisterns for household consumption, 145 thousand cisterns for food production and 5 thousand school cisterns. The Freshwater Program by the Environment Ministry implements a permanent public policy aimed at accessing good quality water for human consumption in low-income populations of the semiarid, through the implementation, recovery, and management of desalination systems since 2004. State Plans have the goal of serving 25% (2.5 million people) of the rural population of the semiarid by 2019. In the 2nd phase of the Freshwater Program (2019-2024), the goal is to have installed 1,727 desalination systems and to implement 103 ‘Biosaline’ productive units, benefiting approximately 1.19 million people.

Other water access programs worth noting are the Sustentar Program and Salta-Z supported by FUNASA/Ministry of Health. These programs seek the sustainability of sanitation actions in rural areas, through the training of managers and operators in diverse alternatives of management, operation, maintenance and water quality control of the water supply systems. Also, the Sustentar Program involves the community served, with education in health and environmental sanitation. The National Water Agency (*Agência Nacional de Águas – ANA*) indirectly stimulates the Payment of Environmental Services policy and directly supports ways of preserving water resources, such as the construction of infiltration terraces and basins, the re-adaptation of vicinal roads, the recovery and protection of springs, the reforestation of permanent protection areas and legal reserves, rural sanitation projects, collection and recycling of waste.

The National Policy to Combat Desertification and Mitigation of Drought Effects and its instruments, as well as the National Commission to Combat Desertification (CNCDD), were sanctioned in July 2015. This law instructs how to map and diagnose desertification processes, including land degradation in arid, semiarid and dry sub-humid areas resulting from various factors and vectors, including climatic variations and human activities.

3.2.5 Environmental Licensing

Environmental licensing was instituted by Law n° 6.938/81 as one of the necessary instruments for the protection and improvement of the environment (art. 9th, IV), as it verifies the possibility of negative environmental impacts caused by the construction, installation, expansion and operation of establishments and activities that use environmental resources, as well as establishes the necessary measures for their prevention, repair and mitigation.

Environmental licensing is the procedure whereby the competent environmental agency licenses a potentially polluting activity after technical analysis, which imposes on the entrepreneur a series of measures aimed at maintaining the ecologically balanced environment. Thus, the scope of environmental licensing is to reconcile economic development with environmental preservation.

To discipline the environmental licensing aspects established in PNMA, Conama Resolution n° 237/97 was issued, which deals specifically with environmental licensing.

Failure to comply with any conditions, restrictions, requirements and environmental control measures defined by the environmental agency as conditioning factors may lead to the suspension or cancellation of the licenses related thereto, without prejudice to civil, administrative and, in certain cases, criminal liability.

¹⁰⁹ The concept of social technology (ST) (*‘Tecnologias Sociais’* in Portuguese) was developed in Brazil during the decade of 2000. Although there is no official definition for this concept, it can be defined as a way to design, develop, implement and manage technology oriented to solve social and environmental problems. In more practical terms, STs are understood as products, techniques or methods that have a low cost and can be replicated, developed and/or applied in interaction with a community, which represent social transformation solutions through the sustainable use of local resources. Examples of STs are: small rainwater harvesting cisterns for domestic use and larger ones for backyard garden irrigation, ecological stoves (*eco-stoves*), farm water reservoirs (*trench barriers*), household greywater treatment systems (*biowater reuse system*), underground dams. (FERNÁNDEZ, L. et al. Synergies and trade-offs between climate change mitigation and adaptation strategies: lessons from social technologies in the semiarid region of Bahia, Brazil, Latin America. *Latin American J. Management for Sustainable Development*, v. 3, n. 1, p. 1-18, 2016; and REDE-DE-TECNOLOGIA-SOCIAL, Ed. *Tecnologia Social e Desenvolvimento Sustentável: contribuições da RTS para a formulação de uma política de Estado de Ciência, Tecnologia e Inovação*. Brasília, DF: Secretaria Executiva da Rede de Tecnologia Social (RTS)ed. 2010.

a) Environmental licenses or permits

The Conama Resolution n° 237/1997 establishes all the steps that must be followed in the licensing process (art. 10) and defines the environmental licenses to be issued by the competent environmental agency, namely the Preliminary Licenses - LP, Installation - LI and Operation - LO (art. 8th).

The LP is granted in the preliminary phase of the project planning, where the environmental agency approves, through mandatory prior inspection, the location and design of the project, certifies the environmental viability from the analysis of possible environmental impacts and establishes the basic requirements and conditions to be met in the next phases (art. 8th, I).

After analyzing the specifications contained in the plans, programs and projects presented, including the environmental control measures and compliance with the conditions established in the LP, the environmental agency will issue the LI, authorizing the installation of the project (art.8th, II).

Finally, the LO will be granted after the verification of the effective compliance with the conditions of the previous licenses, authorizing the operation of the project (art. 8, III), after verification of the effective compliance with what the previous licenses determine, such as the control measures. conditions and conditions determined for the operation.

It is emphasized that it is essential to observe the conditions, restrictions, requirements and environmental control measures required by the environmental agency as conditions in the licenses, given that their failure to comply may result in the cancellation of the license, civil and administrative liability and, in certain cases, criminal liability.

In addition to the licenses provided for in Conama Resolution number 237/97, the licensing process also requires the issuance of authorization for the capture, collection and transportation of fauna; land use certificate; authorization for vegetation suppression; authorization for archaeological prospecting and salvage and reserve of water availability/granting the right to use water resources, among others.

In this context, an emergency measure has been taken by every state of the semiarid stating that all infrastructure works and activities aimed at mitigating the effects of droughts are either exempt from the environmental licensing process or have a simplified licensing mechanism in place. The following activities considered in the project are exempted from environmental licensing:

- Construction and installation of cisterns, dams and other equipment for the abstraction and retention of water of any kind, shape or model.
- Implementation of irrigated production systems using micro sprinkler or drip technology in areas of up to 1 ha (one hectare),
- Installation and recovery of wells up to 50 m deep, as well as artificial reservoirs, dams or barriers, with up to 2 ha of the water surface;
- Purchase of animals with health certificates issued by the responsible bodies
- Works and services of soil correction;
- Construction of fences, corrals and machine sheds;
- Agricultural and livestock activities carried out in dry regions that are not subject to irrigation, will be exempt from environmental licensing according to the State Laws in the semiarid.

The activities contemplated in the project must comply with the following regulations at the federal and state levels:

Bahia

According to Law 10,431/2006, undertakings and activities necessary to mitigate the environmental, social and economic effects of an emergency or public calamity resulting from drought shall follow a specific procedure for simplified environmental licensing. The application for the simplified environmental licensing should be addressed to the Institute of Environment and Water Resources – INEMA.

Ceará

The State Council for the Environment- COEMA, through resolution No. 01 of February 2018 establishes a review of the procedures for Simplified Environmental Licensing for emergency works required to cope with drought in the State of Ceará. The State Superintendence of the Environment – SEMACE will proceed to the analysis of the framework of the application of the Resolution COEMA N° 10 of June 11, 2015.

Paraíba

According to the administrative standard N° 125 of 2015 issued by SUDEMA (Paraíba's environmental authority), cisterns, small dams and public works considered goods of common use - such as desalination facilities, are exempt from environmental licensing process provided they do not involve further deforestation or environmental degradation.

Pernambuco

Decree No. 38146 of 2012 establishes procedures for the Simplified Environmental Licensing of emergency works necessary to confront drought in the State of Pernambuco. The State Agency for the Environment - CPRH will analyze the framework of the application.

Piauí

The Secretariat of Environment and Water Resources - SEMAR will analyze the framework of the application of Decree No. 14921 from 2012 which regulates the Simplified Environmental Licensing for the same activities mentioned above.

Rio Grande do Norte

Institute of Sustainable Development and Environment of Rio Grande do Norte -IDEMA, through Ordinance No. 55 of 2013, resolves the activities and circumstances under which a Simplified Environmental Licensing applies.

Sergipe

The Council of Environment of the State of Sergipe- CEMA / SE will analyze the framework of the application of Administrative Standard. 01/2009.

3.2.6 Climate Change

In 2015, Brazil submitted its Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC). Brazil is committed to reducing greenhouse gas (GHG) emissions by 37% below 2005 levels by 2025 and, as a subsequent indicative contribution, to reducing GHGs by 43% below 2005 levels by 2030. The Government of Brazil (GoB) is committed to the implementation of its NDC, including full respect for human rights and the rights of vulnerable communities, indigenous peoples, traditional communities and workers in sectors affected by corresponding policies and plans, and are promoting gender-sensitive measures. The Federal Government is equally committed to achieving its NDC targets as it works to eliminate extreme poverty and reduce inequality. A large part of the NDC target is based on reducing emissions from deforestation and degradation (REDD).

The NDC goals reaffirm some prior Brazilian commitments and update others. Indeed, most of the Brazilian targets are already embedded in existing laws and national plans. Including them in the NDC is essential to inform the international community about Brazil's ambitions to strengthen and consolidate these policies in domestic debates and to attract investment to meet the goals.

The NDC's goal of restoring and reforesting 12 million ha (7 million ha of tree plantation plus 5 million ha of restoration) will be accomplished by complying with its Native Vegetation Protection Law ("Forest Code"), and the subsequent National Plan for Restoration of Native Vegetation (PLANAVEG). According to the Forest Code, some set-aside areas - e.g. Legal Reserves (*Reservas Legais* - RLs) and Permanent Preservation Areas¹¹⁰ (*Áreas de Preservação Permanente* - APPs) – for conservation can be sustainably harvested and include the partial use of exotic species, such as pines and eucalyptus, interplanted with native species, which could mitigate the cost of restoration and even provide profits. The implementation of PLANAVEG should contribute to the achievement of this commitment, regarding the recovery of the native vegetation of APPs and RL and areas of low agricultural productivity.

PLANAVEG applies the same logic used to define the national recovery goal of 12 million ha to regionalize this amount among the six Brazilian biogeographic regions. The values indicate that most of the defined recovery goal is concentrated in the Amazon and Atlantic Rainforest (76%), while the *Cerrado* represents 17%, the *Caatinga*, 4% (500,000 ha), and the remaining 3% divided among the *Pantanal* and *Pampa*. PLANAVEG recognizes that in the family agriculture context, "the implementation of agroforestry systems for the composition of Legal Reserves can also contribute to food security, nutrition, income, health, shelter, social cohesion, energy resources, and environmental sustainability." Other relevant instruments of the Forest Code are the Environmental Rural Registry (*Cadastro Ambiental Rural* - CAR) and the Environmental Compliance Program (*Programa de Regularização Ambiental* – PRA).

The social dimension is at the core of Brazil's adaptation strategy, bearing in mind the need to protect vulnerable populations from the adverse effects of climate change and enhance resilience. In this context, Brazil is working on the design of new public policies, through its National Adaptation Plan (*Plano Nacional de Adaptação à Mudança do Clima* – PNA), in its final elaboration phase. The active involvement of stakeholders, at all levels, will contribute to the formulation and implementation of Brazil's National Adaptation Plan.

In this context, the country National Adaptation Plan puts forward cross-sector adaptation strategies to address the wide range of risks that climate change is creating and is the means to implement the adaptation aspect of the National Determined Contribution. The National Adaptation Plan also will establish guidelines to implement adaptive measures to increase climate resilience in 11 sectors and themes.

The NDC presents the strengthening of the Low Carbon Emission Agriculture Program (*Plano ABC – Agricultura de Baixa Emissão de Carbono*) as the primary strategy for sustainable agriculture development and commits to restoring 15 million ha of degraded pasturelands, enhancing 5 million ha of integrated cropland-livestock-forestry systems and restoring and reforest 12 million ha of forests by 2030. The ABC Plan is one of the sectorial plans devised under the National Policy on Climate Change. Its overall objectives are: reducing greenhouse gas emissions in agriculture; improving the efficiency in the use of natural resources; increasing the resilience of production systems and rural communities; and promoting adaptation to climate change in the sector. One of the main instruments of the policy is the National Plan of Agroecology and Organic Production (*Plano Nacional de Agroecologia e Agricultura Orgânica* – PLANAPO), known under the name of 'Agroecological Brazil', conceived with the participation of various sectors of civil society.

3.2.7 Other Related Projects and Programs in the Semiarid

The sections above show that the federal government has instituted, over the last 25 years, several policies and programs designed to support family farmers, and before the economic crisis, there was a significant reduction in poverty in rural Northeast Brazil. States and municipalities, as well as NGOs, also have implemented projects and programs to strengthen family agriculture, many of which are in partnership with international funding organizations (IFAD, World Bank, European Union, Inter-American Development Bank, Global Environmental Fund). However, there is a clear gap in programs to support family farmers in a transition into more climate-resilient agriculture in the semiarid, considering that most of the recent and on-going initiatives mainly focus on poverty reduction. The current project seeks to integrate the climate policies with water management and poverty alleviation programs to improve ecosystem services and support family farmers in the adaptation to climatic change.

¹¹⁰ APPs are mandatory on hilltops, steep slopes, coastal shrublands, mangroves, wetlands, around springs, and along watercourses and reservoirs.

- BNDES initiatives

Over the years, the primary financial support provided by BNDES to States for family agriculture has been for the Northeast region with non-reimbursable funds from the BNDES Social Fund. There are on-going projects in seven states of the region - Alagoas, Bahia, Ceará, Maranhão, Paraíba, Piauí, and Sergipe. Most of them support collective family farming economic arrangements (cooperatives and associations) which are focused on production processing and marketing.

Regarding water harvesting and storage techniques and structures, BNDES has already provided support for the installation of 24,000 large cisterns (the model for production) in nine States of the Brazilian Semi-arid. Another 6.8 thousand large water cisterns are planned. One-third of the benefited families are also assisted by the Program for the Promotion of Rural Productive Activities (*Programa Fomento Rural*) of the Ministry of Citizenship.

BNDES, in partnership with Banco do Brasil Foundation (*Fundação Banco do Brasil – FBB*), have already financed seven agroecology, 'extractivism', and organic production networks in the Northeast. Currently, two selection processes are underway within the Ecoforte Program for Strengthening and Expansion of Agroecology, Extractivism and Production Networks (*Programa de Fortalecimento e Ampliação das Redes de Agroecologia, Extrativismo e Produção Orgânica - Ecoforte*), which involves various governmental agencies, as well as several organizations, from the private sector. BNDES has also provided financial support for the implementation of 3,300 Integrated and Sustainable Agroecological Production (*Produção Agroecológica Integrada e Sustentável – PAIS*) units, in partnership with NGOs of the semi-arid region.

BNDES Social Fund resources have been used, through the APIMC association (*Associação Programa 1 Milhão de Cisternas – APIMC*), to install 440 community seed-banks. This initiative aims to reinforce existing community practices of self-organization that help maintain local biodiversity (including crop biodiversity).

A partnership between BNDES and Brazilian Agricultural Research Corporation (*Empresa Brasileira de Pesquisa Agropecuária – EMBRAPA*) was established to implement the InovaSocial Program. It aims to contribute to the productive inclusion of family farming through the strengthening of farmer networks focused on: i) the production, processing, and marketing of goat and sheep products, ii) rescue, preservation, multiplication, storage, distribution and commercialization of agroecological seeds.

The Productive Semi-arid Project (*Projeto Semiárido Produtivo*), executed by the Regional Institute of Small Agriculture (IRPAA), is also being implemented in the Northeast region with the support of BNDES's Social Fund. The initiative has the goal of structuring productive family units for processing and commercializing products from family farming to promote and spread practices of coexistence with the Semi-arid environment¹¹¹.

- IFAD's work

IFAD has been operating in the Northeast of Brazil since 1978. Currently, the agency's finance portfolio sums US\$ 450 million, reaching 350 thousand families with six projects. IFAD has 5 State projects in Piauí, Ceará, Paraíba, Sergipe, and Bahia. A sixth project is implemented in partnership with the Secretariat of Family Farming and Cooperativism (*Secretaria da Agricultura Familiar e Cooperativismo*) of the Federal Government. It refers to the second phase of Dom Helder Câmara Project and covers 11 states - Minas Gerais, Espírito Santo and the 9 States of the Northeast.

These projects support the productive structuring of family units through non-reimbursable investments. The beneficiary families receive technical assistance services (TAS) for two to three years, aiming at strengthening organizational and technical capacities according to the principles of agroecology. The main supported

¹¹¹ The phrase 'coexistence with the semi-arid' of the region refers to a set of different networks, local ideologies and actions, having as a common trait the attempt to help vulnerable communities to adapt themselves to living under semi-arid climate conditions. Most of the strategies proposed and developed within this movement involve the use of ST, considering that traditional or more elaborate technological solutions are not appropriate for the social, environment and economic context of the semi-arid region. (FERNÁNDEZ, L. et al. Synergies and trade-offs between climate change mitigation and adaptation strategies: lessons from social technologies in the semi-arid region of Bahia, Brazil, Latin America. **Latin American J. Management for Sustainable Development**, v. 3, n. 1, pp. 1-18, 2016.)

productions are those of the Brazilian semiarid: cashew and other native fruits (such as *umbú*, *licuri*, *caatinga passion fruit*, *cajá*, *mangaba*), beekeeping, the breeding of small animals (sheep, goats, pigs and poultry), including the production and storage of fodder, and the production of vegetables and medicinal plants in irrigated gardens. IFAD financed projects have also included the structuring of cooperatives for the creation and strengthening of processing units with both physical investments and capacity building (administrative, financial and commercial).

These projects also finance the installation of water access social technologies, such as production cisterns with cemented catchment areas, trench water tanks, underground water barriers, graywater reuse equipment.

Since 2011, IFAD has funded the Semear Program, whose primary objective is knowledge management. The activities carried out have allowed the identification of good practices, and the dissemination of the results and methodologies used. Numerous exchanges and learning initiatives have been organized mainly in the Northeast region. Some South-South cooperation activities with other Latin American and African countries also allowed knowledge sharing between farmers and technical staff involved in the project.

Most of these projects have provided support for the construction of processing units (processing of fruit, milk, honey, cassava, among other products) usually conducted by cooperatives. Whenever these units have idle capacity, the technical teams are responsible for connecting project beneficiaries to these cooperatives and existing units to add value to production and improve market access conditions. With this same perspective, family farming fairs or markets were structured in local towns and constitute a fundamental form of direct sale and weekly marketing of *in natura* of fruit, vegetables, honey, poultry, eggs, medicinal plants, and cheeses. The project is responsible for inserting the beneficiaries in these fairs for income improvements. Women's involvement is essential in these fairs and related production processes. Thus, this initiative is strategic for ensuring they have direct access to better revenue.

These projects have left a remarkable legacy on at least three levels. First, impacts are clear within state secretariats that adjusted their knowledge and experience, becoming familiar with the procedures for implementing such projects. Private and public technical assistance, or rural advisory services¹¹², providers also accumulated experiences and practice. In most cases, this second group of actors got involved in field implementation initiatives. These organizations can be mobilized again because of their strong and updated capacities on specific themes. Finally, these projects also allowed the strengthening of farmers' communities and families who received productive investments, training, and technical assistance services. They are now more prepared than other farmers to use social technologies and different types of actions financed by the Project.

The activities carried out by these other projects and programs will be considered for the selection of beneficiary municipalities, seeking to optimize the complementarity of resources and avoiding overlap.

- Other initiatives

There are also several non-governmental initiatives that develop climate-smart agriculture. We will mention the 'Intelligent and Sustainable Agroclimatic Modules Program' (*Programa Módulo Agroclimáticos Inteligentes e Sustentáveis – MAIS*), financed by the Proadapt fund and other donors, has worked on community-based adaptation strategies and helps family farmers develop a more resilient agriculture in the Jacuípe Basin, a semiarid region of the State of Bahia¹¹³. The program has engaged about 650 farmers, increasing their production by 63% and their income by 204%. In addition, more than 3 tons of CO₂ emissions can be offset for each restored pastureland. A second initiative that deserves mention is the FAO and Environment Ministry (*Ministério do Meio Ambiente – MMA*) REDESER (small scale) project, working with GEF funding, that is working on ways to reverse desertification process through agroforestry practices and productive systems¹¹⁴.

¹¹² The term 'Rural Advisory Services' includes technical assistance for agriculture and animal husbandry, and goes beyond, including other necessary advisory services. (ADOLF, B. **Rural Advisory Services Worldwide**. Lindau, Switzerland: GFRAS, 2011. Available at: <http://www.g-fras.org/en/knowledge/gfras-publications/file/6-rural-advisory-services-worldwide>).

¹¹³ From the UNFCCC website: <https://unfccc.int/climate-action/momentum-for-change/financing-for-climate-friendly-investment/mais-program-climate-smart-agriculture>.

¹¹⁴ See FAO website at: <http://www.fao.org/brasil/noticias/detail-events/pt/c/1073924/>.

We will also refer to other well established agroecological initiatives, fostered by NGOs, that have developed different types of ‘climate-resilient production systems’. For example, Centro Sabiá has worked on agroforestry systems in the state of Pernambuco, while PATAC and AS-PTA have provided support to family farmers to develop their own resilient systems in Paraíba State. One recent interesting example is the ‘Cotton in Agroecological Intercropped Plots Project’ (*Projeto Algodão em Consórcios Agroecológicos*), that is being implemented by a group of NGOs working in different states, with the financial support of the C&A Foundation and the Porticus Foundation. The ‘agroecological intercropped plot’ initiative that produces certified organic cotton, as well as other food crops, was started by the IFAD-funded Dom Helder Camara Project (Phase 1) several years ago¹¹⁵.

The proposed Project will build upon previous work by strengthening and expanding climate-resilient productive models, along with nurseries and seedbanks, improving the availability of suppliers and building knowledge networks of farmers practicing agriculture adapted to the current and expected climate conditions. It also brings a fresh look at rural youth and technology integrating climate adaptation measures with water management and income generation to improve ecosystem services and support the vulnerable population in overcoming climatic stressors.

¹¹⁵ SANTIAGO, F. et al. Algodão em consórcios alimentares agroecológicos: Uma experiência de desenvolvimento sustentável no Semiárido nordestino. In: BALSDI, O.; CRUZ, M. D., et al (Ed.). **Transferência de tecnologia e construção do conhecimento**. Brasília (DF): Embrapa, 2013. p.249 - 283.

4. THE ADAPTATION SCENARIO, WITH THE PLANTING RESILIENCE IN RURAL COMMUNITIES OF THE BRAZILIAN SEMIARID PROJECT

The resilience of the target households depends on reliable access to both food and water, and without these landscape restoration activities, under conditions of climate change, these households will face increasing water and food insecurity, which would eventually render their livelihoods unsustainable.

The **Planting Climate Resilience in rural communities of the Northeast (PCR)** will work towards shifting the prevailing paradigm, assuming it is possible to transform family farmers' productive systems in the semiarid, enabling an increase of their production while simultaneously improving their capacity to face the challenges posed by ongoing climate change. The project's primary goal will be to transform present-day farming systems, to attain resilient and productive systems performing restored ecosystem functions, which in turn, will both increase and stabilize family income and food security while incentivizing young generations to remain active in agricultural activities. The partnership between IFAD, GCF and the Government of Brazil (GoB) through a major national Bank (BNDES) will mobilize resources and disseminate lessons too many levels of government, as well as to other regions in Brazil and abroad.

4.1 Theory of Change

As shall be seen in more detail in section 4.3, the **Planting Resilience in Rural Communities of the Brazilian Semiarid Project** will have three components that reinforce one another to promote climate resiliency as well as emission mitigation: (I) Climate Resilient Productive Systems (CRPS), (II) Access to Water for Production, and (III) Knowledge Management and Scaling-Up.

The Project's 'Theory of Change' (TOC) (see figure 19 below) shows that the Project's action, through its components, will contribute significantly to overcome the barriers faced by the family farmers in their agriculture, animal husbandry, extractivism productive activities.

Implementation of CRPS, as proposed under Component 1 (Outputs 1, 2 and 3), will influence hydrological conditions across the landscape. The Caatinga is a rich productive area, with fertile soils, where temporary streams and wetlands exist, making up a biome with good capacity for agricultural production, provided that adapted vegetation is used, with adequate arrangements and techniques appropriate to the levels of humidity and solar radiation. Output 4 (Activities 4.1 and 4.2) will provide a supportive network for farmers to exchange best practices, stimulate entrepreneurship and innovation as well as foster active leadership of women and youth.

The water access solutions proposed in Component 2 (Output 5), such as rainwater harvest and storage, if accompanied by the current agricultural model, may be temporarily palliative – subject to severe water loss due to high evapotranspiration from heat and wind – but productivity would remain limited. In fact, water investments in the semiarid must be complemented by soil recovery practices promoted in Component 1, to allow infiltration of rainwater, increase soil biomass rate, create shade and wind shelters to reduce evapotranspiration (which can exceed 2,000 mm/year). The specific flora and fauna in the semiarid have developed a high capacity to access and store water (in roots, trunks, stems and leaves), resulting in a biota capable of supplying more water than needed for growth and reproduction, adding surplus water to the system. The first years of the CRPS implementation are the most vulnerable, so activities 5.1, 5.2 and 5.3 will increase the availability of water in the system, reducing impacts of droughts, while the system is still fragile.

Knowledge management, policy dialogues, communication, and monitoring and evaluation (M&E) activities under Component 3 (Outputs 6, 7 and 8), meanwhile, will allow the investments under Components 1 and 2 to be sustainable and scaled up to other states in the region and dryland areas, including other countries, resulting in the intended paradigm shift in approaches to climate adaptation and mitigation.

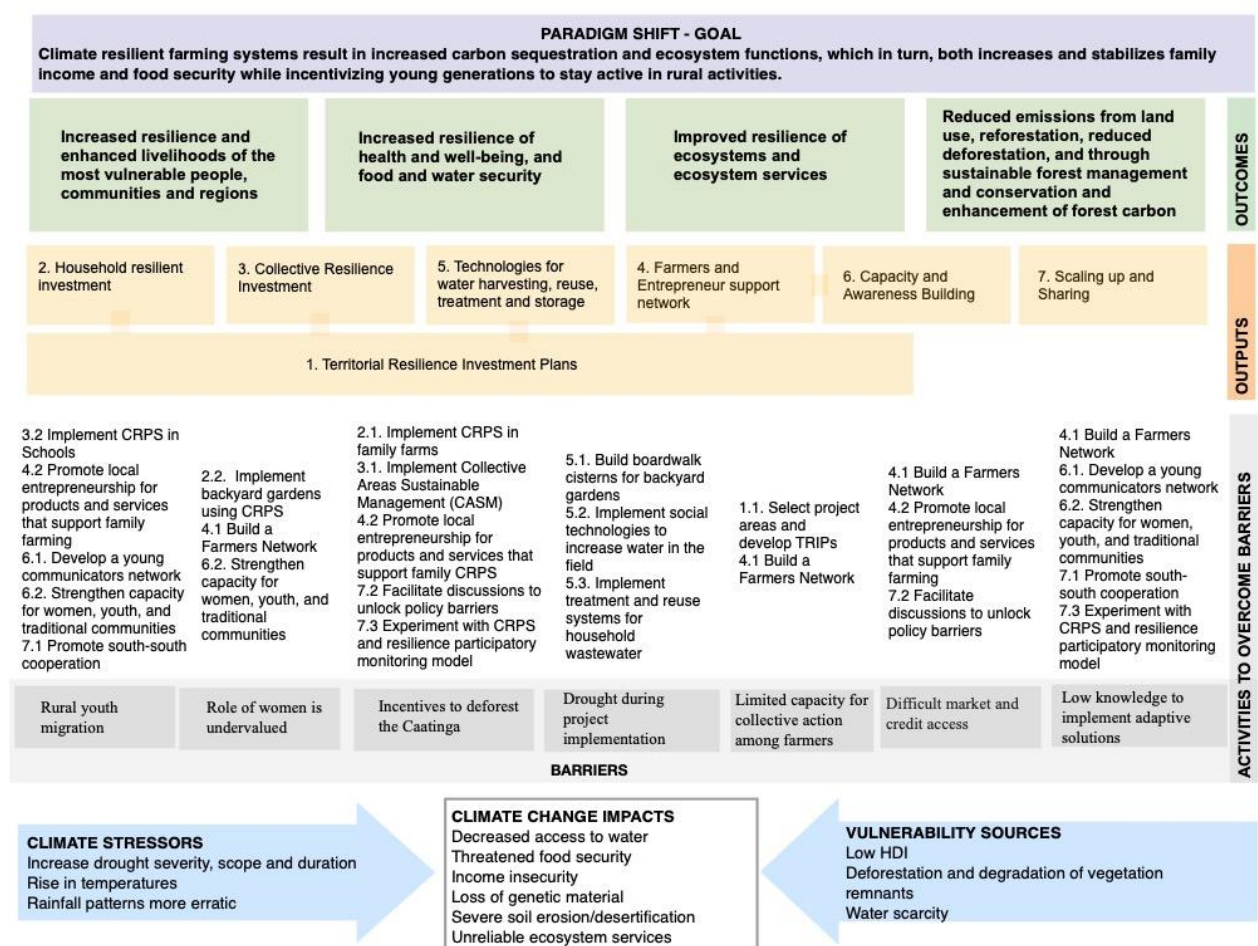


Figure 18 Project's Theory of Change

In order to mitigate the risks and overcome barriers faced by the semiarid agricultural families in their production activities, the Project will promote a shift from the predominant current agricultural and animal husbandry paradigm, which focuses on monocultures and the top-down application of static technological packages, to one which is characterized by i) the promotion of dense, stratified and diversified systems (CRPS); ii) farmer-led technology development; and iii) active leadership from women and youth, which thereby enables farmers to adapt effectively to the impacts of climate change. This rationale guides the definition of the Project objectives, components and activities.

The Project's youth and gender focus will seek to ensure greater opportunities for women and youth in all three components. Traditional, indigenous and afro-descendant (*quilombola*) communities' participation will also be prioritized.

Finally, whenever possible, the project will establish partnerships to strengthen the complementarity with other state and federal projects, programs and public policies. At the same time, it will also be actively engaged in establishing partnerships with the private sector (for training, provision of technical advice, access to markets, etc.), when the opportunities appear.

4.2 Proposed alternatives

4.2.1 Project proposal design parameters

During the Project design process, IFAD promoted different forms of stakeholder consultation, including field visits, meetings with various institutional stakeholders, as well as a full-sized consultation workshop. IFAD also organized a brainstorming process with the Project design team on this issue. This process discussed different facets of the Project's design. One crucial point was the choice of technical proposals, considering the institutional, informational, regulatory, behavioral, technological, engineering, financial aspects.

In order to choose the set of proposals the Project will work with, that will help adapt to the climate signals and reduce vulnerability drivers identified above, as well as mitigate climate change emissions, a set of design parameters were used. These parameters consider the barriers to change discussed above (section 3.1), as well as other important references, such as their environmental impact.

Note that IFAD's target beneficiaries are always the most vulnerable group, the poorest of the poor. Given this target beneficiary, the Project's main design parameters are:

- Low-cost solutions

One of the key barriers that bolster the present status quo refers to the limited capacity farmers have to spend and make investments. Because of this, the Project proposes to implement alternatives that are low cost to install and maintain and that, in this domain, could be replicated easily by other family farmers.

- Can be implemented by workforce available to family farmers

As seen above, the demographic dynamics in the region, which includes an important migratory contingent of young people as well as an aging population, mean that family labor is becoming scarcer. In addition, the hardship involved in this type of work, often of a manual nature, is another factor that makes labor availability more restricted. Therefore, the solutions proposed by the Project must not require a large amount of labor in their implementation or operation. They must be simple enough to be replicated by other family farmers. In Brazil, these are called "social technologies".

- Provide a guarantee of acceptable production and income

As stated in the section describing the context, the current crisis in the production systems of the northeastern semiarid region means that both agricultural and livestock production are declining. In addition, extreme events (such as droughts) are responsible for significant losses. Therefore, the productive proposals worked by the Project must guarantee an acceptable agricultural production while reducing risks from extreme droughts.

- Environmental impact within Category B or C

Although specially selected for their adaptation functions, most of these measures will also contribute to CC mitigation by reducing GHG emissions, avoiding carbon emissions and promoting sequestration. None of the solutions will have significant and lasting negative social and environmental impacts.

- Promote the inclusion of women, youth and traditional communities

Considering the present situation in which rural women and youth of the semiarid region have access to fewer opportunities, the Project deems it is absolutely necessary to engage youth and women. One way to do this is by making the agricultural activity more interesting and intellectually challenging, as well as making it more productive for these specific groups. In this sense, Project proposals features and characteristics must be such that they favor access and implementation by women and youth. In the case of traditional communities, the chosen technical proposals must also respect their specific needs, requirements and possibilities.

4.2.2 Project's proposals

Seeking to increase the resilience of farming families to the conditions created by climate change, the Program will work with an agro-ecosystem approach to promote the adaptation of family and community production and subsistence units to these new conditions. This approach will lead the Project to work primarily with Climate Resilient Productive Systems (CRPS), through the implementation of:

- a) Water collection and storage at household level, allowing the multiplication of other productive proposals such as CRPS, nurseries, etc.
- b) CRPS (in dryland situation), seeking to diversify and 'complexify' (in order to multiply the number of tree, shrub and herbaceous species present) the production systems to maximize biomass production and soil

cover. It is understood that these new 'more complex' systems will favor soil conservation as well as soil moisture retention while also allowing better water management in the production system. They should also allow the growth and diversification of plant and animal production, thus contributing to higher food and nutritional security and increasing the income of beneficiary families.

- c) Within the framework of the implantation of CRPS, special attention will be given to sustainable management in wider areas of *Caatinga* (where they exist), often under collective / community management, to maximize the use of their products. such as fodder, fruit, honey, etc. In these cases, 'ecological' stoves and biodigesters may also be implemented as a way of reducing the pressure on the *Caatinga* vegetation.
- d) Community seedbanks will be encouraged to ensure diversity of local genetic material.
- e) The implementation of CRPS backyards, seeking to enhance the production of food, forage, medicinal herbs and also animal production for greater food security and income generation.
- f) Installation of pilot biosaline production units at the desalination plants in operation.

For implementing these specific alternatives listed above, as well as for overcoming the several barriers already mentioned, the Project will need to also work on the following dimensions:

- g) strengthening the different forms of organization of the beneficiary population in order to build capacity, promote greater autonomy and expand the ability to do work in family units and in the community;
- h) supporting the initiatives of the families served regarding market and capital access;
- i) creating conditions so that some schools in the region can fully incorporate the focus of maximum adaptation and resilience CRPS in their youth formation agenda;
- j) encourage the development of tools and services that will decrease the labor burden of the family farming activities;
- k) promoting dialogue and advocacy in pursuit of the creation/strengthening of public policies that can support the dissemination of adaptive and resilient systems;
- l) promoting the communication of the results of efforts to implement adaptive and resilient systems, with a view to spreading knowledge about them to other regions, states and countries.

4.2.3 Technical analysis of the Project's proposed alternatives

The climate stressors and vulnerability sources result in a number of climate change impacts. The predominant farm production of monocultures and top-down application of static technological packages are clearly not are not resilient to these impacts. FAO¹¹⁶ (based on IPCC)¹¹⁷ classified practices to improve farmer's climate resiliency into: integrated nutrient management, improved agronomic practices, tillage and residue management, water management, and agroforestry. These practices are often referred to as Climate Resilient Agriculture, and can consist of several methods, arrangements, and technologies. What climate resilient is in one biome or production system may not apply to another. Climate challenges are also varied in any given geography, and adaptation solutions depend on volume of the area and resources available to the farmer. Thus, given the vulnerabilities, ecosystem characteristics and potential changes in climate, climate resilient agriculture for family farmers in the Brazilian semiarid translates into practices that increase availability, flow and retention of water in the system. Pragmatically, it means simultaneous implementation of the following practices and principles, (which are hereby denominated CRPS): (i) soil preparation: maintenance of dispersed

¹¹⁶ Branca G, McCarthy N, Lipper L, Jolejole MC. Climate Smart Agriculture: A Synthesis of Empirical Evidence of Food Security and Mitigation Benefits for Improved Cropland Management. Rome, Italy: Food and Agriculture Organization; 2011, pg. 1–42.

¹¹⁷ IPCC. 2007. Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Chapter 8-Agriculture. Climate Change 2007: Mitigation. Cambridge, United Kingdom and New York, NY, USA Cambridge University Press.

trees, setting up cradles and natural fertilization; (ii) soil protection: soil cover and biomass production with resilient plant varieties; (iii) water management: capture and storage (both in soil and vegetation), level curves and terraces; (iv) planting: stratification, diversification and densification with herbaceous, shrub and tree species maximizing photosynthetic capacity; (v) management: active pruning and thinning; and (vi) Grazing: pasture rotation, fences and silage.

While CRPS practices have the potential to yield sustainable land-management benefits and increase production, they require a significant change in habits, culture and investments. GCF support will enable farmers to take a longer-term perspective in anticipation of the significant financial, economic and livelihood benefits achievable through the application of adaptation measures relative to the declines in production and income that are anticipated to result from the effects of climate change. It responds to the urgency that climate change projections give to the application of these practices, and recognizes that for them to function effectively as adaptation measures, they must be applied as part of a larger-scale program and be calibrated and adjusted based on the specific needs, priorities and cultural context, both at the regional and family-productive-units levels.

These principles are interlinked and their benefits are synergic, meaning they must be implemented together. Assembling an agricultural system with these elements makes it a water producer, not a consumer, which is the correct approach for a region with low water availability. Table 1 below presents the direct adaptation benefits that each principle provides to the family farmer. In addition, CRPS will provide higher diversity and availability in food, diversity of income streams that can buffer against climate and market shocks as well as induce a net farm output/yield income stability, increase availability of food and incomes, reduce carbon emissions and improve ecosystem services.

Table 1. Principles and practices of climate-resilient production systems in the Semiarid

Practices / Adaptation Benefits	Retain soil moisture	Recharge soil moisture	Increase organic matter in soil	Increase photosynthesis	Increase soil carbon	Capture water	Capture humidity in air	Improve microclimate	Reduce erosion
(i) Soil Preparation: Maintenance of dispersed trees, micro-valleys and natural fertilization	X		X	X				X	X
(ii) Soil Protection: Soil cover and biomass production with resilient plant varieties	X		X		X	X	X		X
(iii) Water retention: level curves and terraces		X				X			X
(iv) Planting: Stratification, diversification and densification			X	X		X		X	X
(v) Management: Active pruning and thinning;				X				X	
(vi) Grazing: Pasture rotation and fences.			X	X	X				X

As suggested in the previous section, the Project proposes to support the implementation of technical proposals to increase the resilience of family production units. This implementation of innovative plans should assist in the configuration of Climate Resilient Production Systems (CRPS), thus contributing to the improvement of the management of productive units mentioned here. These proposals will be discussed briefly in the following paragraphs.

Resilient agrosilvopastoral systems (in dryland situation)

The implementation of CRPS will be achieved by the simultaneous application of the following management principles and practices:

- (i) Specific soil preparation, eliminating burning, maintaining pre-existing trees and preparing 'cradles' to retain more moisture (when necessary) and use of organic fertilizer;
- (ii) Soil protection through on-site biomass production with resilient plant varieties and their application to maximize soil cover;
- (iii) Water management, with specific initiatives aimed at its collection and storage (both in soil and vegetation), through contours and terraces and the planting of plant species that have the characteristic of storing water;

- (iv) Construction of a suitable 'architecture' or 'structure' for the system by diversification, high-density planting and stratification. This requires a right choice of the species to be planted, including herbaceous, shrub and tree species in order to maximize the photosynthetic capacity of the plot;
- (v) Agrosilvipastoral management, through practices such as pruning and thinning, seeking to eliminate senile plants and stimulate the vegetative vigor of the set; and
- (vi) Forage management of the system, which will require the implementation of fences (to control grazing), as well as the performance of collection practices and eventually forage processing, to be provided to the herds. For details, see APPENDIX I.

There are many types of systems that fit the definition above. Some may be simpler, with fewer species. Others may be more complex, with high biodiversity and intensive management. The actual shape depends on the local situation in terms of available environmental resources (soil type, existing vegetation, rainfall, etc.), farmers familiarity with crops, markets, area availability or family needs and choices.

The implementation of these systems will allow a very significant increase in the number of trees, shrubs and herbaceous species in a given plot or area, boosting biomass production and ensuring better soil cover. These more "complex" production systems will stimulate photosynthesis and carbon fixation, promote soil conservation, and retain soil moisture, allowing for better water uptake and conservation, which will make these systems more resilient to soil temperature increase and higher variability of precipitation caused by ongoing climate change. The expansion and diversification of crops and livestock in these areas will provide greater food and nutritional security while allowing beneficiary household income to grow and provide a buffer against climate stressors.

The Project will encourage farmers to apply resilient production principles and practices to establish various types of CRPS. Given the characteristics of the Semi-arid, supported resilient systems - especially those in rainfed conditions - should be deployed and managed to increase system availability, flow, and retention.



Figure 19 Agroforestry of forage production in the dry season - Sertão de Pernambuco.

In the Semi-arid region the animal component of the systems is essential. Practically all families raise at least some ruminant heads, be they goats, sheep or cattle. For this reason, forage production is always an essential element, sometimes being the farmer's priority. Thus, concrete examples of agroforestry systems implemented in family units combine annual food and fodder crops with perennial plants that also provide human food (fruits, for instance), fodder, and other products (such as wood, firewood, fiber, honey, etc.). Over time, this combination may change, reducing the space available for short-cycle crops, and with tree species becoming more important.

The Centro Sabiá and *Caatinga* entities, which work in the semiarid region of Pernambuco, conducted a survey of 15 families that work with already consolidated agroforestry systems. Some of the results of this research are very useful as they allow the characterization of these systems. All systems surveyed are multispecies, having incorporated several shrub and tree species. But the diversity of shrubs and trees is not homogeneous: while the case with the least variety had 7 species of this type, there was a system with 41 species of woody plants. Of the 22 most common shrub and tree species for the 15 surveyed cases, 14 were fruit trees (cashew, mango, cashew, orange, guava, etc.). Of the remaining 8, there are some exotic species that are at the same time "fertilizers" (for being leguminous) and forage: these are *gliricidia*, *leucena* and *moringa*. The most popular native trees were the thrush, the *catingueira* and the *canafistula*. These three native species are forage, having other uses as well.

This research presents production data from only one case, shown in the following table.

Table 2 Production of the agrosilvipastoral system of the family of V and S, Sertão do Araripe (PE), for the year 2014¹¹⁸

Products	Amount
Harvest Products	
Beans (macassar beans, fava beans, <i>guandú</i>)	90 kg
Grains (corns)	100 kg
Cucurbitaceae (<i>jerimum</i> , pumpkin)	150 kg
Roots (manioc)	1,000 kg
Livestock Products	
Poultry (chickens – meat)	20 kg
Poultry (chickens – eggs)	104 dozens
Vegetables	
Lettuce, arugula, tomates, cilantro, chives, string beans, etc. (18 types)	Approximately 100 kg
Fruits	
Papaya, passion fruit, Orange, acerola, banana, cashew, cajá, etc. (30 types)	Approximately 3,000 kg
Other Products	
Seeds, seedlings, fodder, firewood, native fruits for processing (<i>cambuí</i> and <i>murta</i>) and flowers.	--

These data do not inform the area's productivity since the surface occupied by the system does not appear. But they are useful for presenting very clearly the great diversity of products it provides to the family.

This research was also interested in analyzing the capacity of these systems to produce biomass and fix carbon. The study of the 15 selected systems showed that carbon accumulation ranged from 6.8 to 50.6 metric tons per hectare throughout its implementation, which corresponds to approximately 36 to 186 metric tons of CO₂ equivalent. The average is 78 metric tons of CO₂ equivalent. These figures highlight the importance that agroforestry systems can have in mitigating greenhouse gases in *Caatinga*.

Another study recorded the experience of a farming family from the Cariri region of Ceará. It studied the perception of the family about the various types of results obtained with an agroforestry system of just over 3 hectares with approximately 10 years of existence. The following table summarizes perceived results.

¹¹⁸ GONÇALVES, A. L. R.; MEDEIROS, C. M. D.; MATIAS, R. L. A. D. *Sistemas agroflorestais no Semiárido brasileiro: estratégias para combate à desertificação e enfrentamento às mudanças climáticas*. Recife, PE: Centro Sabiá - Caatinga, 2016. 136 p.

Table 3 The Perception of Economic and Environmental Results after SAF Implementation (Sítio Tabuleiro - CE)¹¹⁹

Dimension	Results
Environment improvement	- Favorable microclimate - Presence of birds and other wildlife - Advantages of working in the shade - No pests
Soil improvement	Ground cover (Burlap)
Short-cycle Crops	Corn, macassar beans (<i>Vigna unguiculata</i>), fava beans, various vegetables.
Fruit cultivation	In total, there are 23 fruit species, including acerola, mango, cashew, <i>umbú</i> , orange, guava, banana, etc.
Forage cultivation	Palma (<i>Opuntia sp.</i>), elephant grass (<i>Pennisetum purpureum</i>)
Presence of native woody species	A total of 19 species of this type were recorded, including <i>angico</i> , <i>sabiá</i> , <i>catingueira</i> , <i>pereiro</i> , <i>fava d'anta</i> , <i>aroeira</i> , etc..
Other tree species	Leucaena

It should be noted that this system includes an important animal component. This herd is fed with fodder and other food harvested in the area and provided. This way, the family raises a flock of 30 goats (confined), pigs and birds (60 free-range chickens). In addition, the household also produces and sells fruit pulp and earns a small income from 'rural tourism' as a result of the frequent visits they receive¹¹⁹.

CRPS backyards

Virtually every family unit in the semiarid NEB has a backyard. These productive backyards, often located around the family home, are already part of the traditional semiarid peasant systems. In the more conventional format, these backyards can be characterized by a certain diversity of species. They are almost always closely linked to a water source, even if precarious that allows irrigation. The fundamental objective of these systems, which are located near the residence, is to contribute to the sovereignty and food and nutritional security, the health and well-being of the family. Women often play a crucial role in maintaining and managing backyards, which we can call agroforestry or CRPS¹²⁰.

More recently, innovations have been introduced in the semiarid region that has allowed these backyards to evolve into a model of resilient agroforestry backyards. Some innovations, such as the installation of production tanks or gray water reuse systems, as well as new agroecological cultivation techniques (including systematic soil cover, a significant increase in the diversity of cultivated species, a substantial increase in tree presence, the introduction of economical flower beds, organic fertilization via compost, earthworm humus, etc.) have shaped this new backyard model, which can also be characterized as an agroforestry system or, more precisely, as a CRPS. The frequency of irrigation, the proximity of the house and the leading role of women farmers are elements that characterize these spaces, distinguishing them from the dryland agroforestry systems, treated in the previous section.

This CRPS backyard, often also called an agroecological or agroforestry yard, comprises the production of food crops (vegetables, roots, etc.), fruits, medicinal and ornamental plants, spices, fodder. It combines herbaceous, shrub and tree species. It also includes the raising of small animals (mainly birds), which derive most of their food from backyard crop production. Given these characteristics, the implementation of these agroforestry yards also follows the defining principles of resilient systems mentioned above.

Currently, these yards are spreading throughout the Semiarid region, thanks to the efforts of several entities that support sustainable development in the region. In this list, it is worth mentioning several projects that were financed by IFAD, such as the People of Value Project (BA), the Sertão Project, among others. The P1 + 2 Program, along with the implementation of Social Water Collection and Storage Technologies, is also working on the implementation of agroecological backyards.

These renewed subsystems have been very interesting in terms of production and productivity. Recent research, still unpublished, notes that “although they occupy proportionally small portions of the territorial

¹¹⁹ SILVA, T. T. D.; DRUMOND, M. A.; BAKKE, I. A. (2014) and SILVA, T. T. D. et al. (2014), as in foot-notes 125 and 126 above.

¹²⁰ MICCOLIS, A. et al. **Restauração Ecológica com Sistemas Agroflorestais: como conciliar conservação com produção. Opções para Cerrado e Caatinga**. Brasília: Instituto Sociedade, População e Natureza – ISPN/Centro Internacional de Pesquisa Agorflorestal – ICRAF, 2016. 266 p.

extensions of agroecosystems, domestic (agroforestry) yards produce, on average, 34% of the aggregate value generated by the agricultural work of families. Just over half of this amount (51%) was converted into monetary income, and the remaining was consumed by families.”

We will cite here the case of a family from the municipality of Santa Filomena, in the *Sertão* of Pernambuco. This family received a drinking water tank as well as a production tank. Over time, it set up agroforestry backyard. In a 2014 visit, it was possible to identify 69 plant species in the backyard, including vegetables (coriander, lettuce, peppers, etc.), medicinal plants (pomegranate, holy grass, etc.), fruit (orange, acerola, pine cone, etc.). This yard produces food for the family, but also allows the commercialization of various products, such as the 50kg of guava that, in the same year 2014, was sold by the family in their own community. There is also the case of a farmer from Sertão do Pajeú, who, after calculating the production, sales and costs of her backyard production activities, concluded that the “income generated by the commercialization of food grown in the backyard (...) reaches about a minimum wage per month.” And this researcher reports that the positive relationship between female farmer, income and productive yard appeared in virtually all interviews conducted with female farmers in this research.

Caatinga Sustainable Management Areas

The Project will implement larger areas of collective sustainable management of *Caatinga* to achieve the full potential of its products and restore ecosystem services. The integration of native forests into traditional production systems favors the maintenance of forest cover in large rural areas, allowing what could be called 'sustainable landscape management'.

It is possible to classify in this category the system known as the Sustainable Agrosilvipastoral Model SAF-Sobral, which was developed by EMBRAPA Caprinos e Ovinos (with its headquarters in Sobral - CE). This model, which includes agricultural crops, animal husbandry (mainly goats and sheep) and use of *Caatinga* products, attaches primary importance to sustainable *Caatinga* management practices, with the aim of ensuring sustainability to the use that families traditionally make of these areas, restoring them and protecting the Biome's soils, waters, and biodiversity.

The fencing of the area and other intervention techniques in the natural vegetation - lowering, thinning and enrichment - that are part of this system seek to promote the regulation of grazing and generate more fodder for the animals (sheep, goats and cattle), potentiate flowering, thus benefiting beekeeping, and optimizing the regeneration of the *Caatinga* vegetation, making the areas more productive in terms of forage and supply of cuttings, firewood, fruits and seeds.

The Sertão Project (GEF-FIDA-MDA) worked with this practice. It monitored the economic results of *Caatinga* management in 2013 and the data identified an annual income of an equivalent (at the time) value of \$ 3,330 /hectare/year per household with meat, honey, cuttings, firewood and medicinal plants. This performance was considered quite positive given the low rainfall that year. A study by EMBRAPA indicates that this system, when compared to conventional land use, yields 50.6% more in terms of household income, employing 25.9% more labor. On the other hand, it uses only 26% of the conventional system area for the same number of animals¹²¹.

¹²¹ ARAÚJO FILHO, J. A. et al. Sistema de Produção Agrossilvipastoril no Semiárido do Ceará. 2nd International Conference: Climate, Sustainability and Development in Semiarid Regions. Fortaleza, Ceará 2010.



Figure 20 Areas of managed *Caatinga*, in the rainy season and the dry season, Ceará.¹²²

Initiatives called *recaatingamento* (which originated with the IRPAA's *Recaatingamento* Project), aimed primarily at preserving and restoring the *Caatinga* of *Fundos de Pasto*. They closely resemble the SAF Sobral system, incorporating the same general principles of resilient systems and many of the practices advocated by the Sobral system. The starting point of this proposal is the isolation of the area (by the implantation of fences) to allow effective management of the herds (starting this management by the total exclusion at first) and some interventions (called hydro environmental actions), such as the stone bushes, which deal with soil management with the aim of reducing soil losses and obtaining higher retention of the scarce rainwater that falls in the region. 'Techniques of environmental restoration', which aim to accelerate the recovery processes of the *Caatinga* vegetation, are also implemented.

Other actions associated with these will seek to increase the productive potential of these areas. Thus, for example, more native fruit trees (such as *umbú*) will be introduced, which will take advantage of the fact that the areas will be with no animals for a while to be able to settle properly. Over time, these fruit trees will increase the yield of the areas. The development of a herd and *Caatinga* management plan should be formulated and implemented by the communities served, seeking to balance the extractions made from *Caatinga* with its regeneration and conservation needs.

Parallel economic activities such as meliponiculture, poultry farming and the processing of *Caatinga* fruits may also be supported, seeking to provide other complementary sources of income derived from ruminant breeding. Finally, some other investments should be associated with this type of intervention, such as 'ecological stoves' and biodigesters, which should be implemented in the homes of families using these areas, with the aim of reducing the use of *Caatinga* firewood.

Selection, storage and guaranteed availability of climate-resilient crop seeds with community seed banks

Over the years, farming in the semiarid region has suffered a dangerous process of genetic erosion of agricultural seeds. Genetic erosion is the term used to name better the process of disappearance of Creole seeds, added to the critical regression of accumulated knowledge and peasant culture from generation to generation on the subject.

In recent decades, the conventional ways of seed entry into the region have not been locally based. This process has led to a scenario of dependence on external seeds, which, for the most part, are inadequate to the semiarid climatic reality. With the abandonment of their own seeds, the family farmers start depending on the seed market to produce their own food, so that without money they could not cultivate the land. As a result, farmers often missed the first rains that were considered strategic for a good harvest. This reality has resulted in the weakening of family farming, creating dependency and demotivating farming families.

In this context, the Community Seed Banks (or Houses) social technology proposes to create a collective space in which family farmers can rescue old practices of preservation, multiplication and selection of seeds adapted

¹²² ARAÚJO FILHO, J. A. Manejo pastoril sustentável da caatinga. Recife, PE: Projeto Dom Helder Camara, 2013. 200 p.

to the region. It also serves as an educational space, where the exchange of experiences takes place, and a reference in the context of strengthening family farming and preserving biodiversity.

Seed Houses operate through the deposit and loan system. Members meet, establish the group's demand seed quantity and variety, and stipulate the amount each member must deposit to begin work. At the time of planting, the partners will have the right to borrow seeds for planting their fields. The stock is controlled through local coordination, using control sheets (membership registration, receipt and inventory control).

Community Seed Banks are organizational structures that provide adequate access to quality seeds at the right time for planting. They act as reserve buffer stocks in the ongoing process of coping with times of adverse weather. They also act as a space for mobilization and debate in the construction of a proposal for a harmonious and sustainable coexistence with the semiarid reality. Community banks also function as a strategic grain storage space for the food and nutritional security of families, especially during the most significant periods of food scarcity, caused by the full use of family stocks. Without them, households used to borrow food from individuals and had to repay 100% after the following year's harvest.

Biosaline production

While the challenge of agriculture (including irrigation here) in arid lands is not new, the increase in soil salinity and especially water scarcity are the main climate change-related stresses for agriculture worldwide, particularly in developing countries. In this context, biosaline agricultural production has been presented as a strategic possibility to enable animal and plant production in arid and semiarid regions of the world.

In the Brazilian semiarid, it is very common for groundwater to be brackish or salty. This happens most often in regions where the substrate is crystalline (which, as seen in section 2.4.2 above, represents approximately 80% of the semiarid area). The result of this is that a substantial percentage of the wells dug in the Semiarid have brackish or saltwater, unfit for human consumption. Thus, a study by the Geological Survey of Brazil Mineral Resources (CPRM), within the scope of the Northeast Water Infrastructure Registry Project, investigated the sources of supply for tubular wells located in the semiarid of the Northeast, encompassing eight states of the Northeast, the north of Minas Gerais and Espírito Santo. The survey, carried out in 450 municipalities of the Semiarid, collected samples from 15,338 wells. This study revealed that only 25% of the wells registered in this area have freshwater (<500 mg/l TDS). It also revealed that 33% had brackish water (501 to 1500 mg/l TDS), while the remaining 42% had saltwater (> 1,500 mg/l TDS). In some localities, the proportion of salty wells is even higher. In the municipality of Boa Vista, state of Paraíba, in a sample of 78 wells surveyed, only 17% had small to moderate salinity waters. In the remaining 83%, there was severe salinity¹²³.

This situation has left many communities and families in an extremely delicate situation regarding access to water, starting with human drinking water. This situation became particularly critical during the 'great drought' which began in 2011. This context formed the foundation for the action of the Fresh Water Program (PAD), which seeks to “promote access to good quality water for the human consumption, incorporating technical, environmental and social care in the management of desalination systems, mainly in diffuse rural communities in the Brazilian semiarid region.” By December 2018, the PAD had already installed 508 desalination plants in as many communities in the Brazilian semiarid region.¹²⁴

Installing a desalination plant in a community creates a *sui generis* situation where this equipment produces, in addition to a certain amount of drinking water (suitable for human consumption), a relatively large amount of ‘concentrate’ (or tailings), which is water with a considerable concentration of salts. It should be noted that the ‘concentrate’ salinity logically depends on the salt content of the original water from the well. However, the salinity of the tailings will always be higher than that of the well water. A survey conducted in the municipality of Pentecost in CE showed that the salinity increase in residual water, when compared to that of the well water of origin, can vary from 20 to 41%¹²⁵.

¹²³ FARIAS, D. S. C. R.; FARIAS, S. A. R.; DANTAS NETO, J. **Indicação de plantas para irrigação das águas com teores elevados de sais na região de Boa Vista-PB**. Congresso Técnico Científico da Engenharia e da Agronomia CONTECC'2016. Foz de Iguaçu, PR 2016.

¹²⁴ The broad objective of this program is to build 1,200 desalination equipments. Available at: <http://noticias.ambientebrasil.com.br/clipping/2017/12/09/140672-programa-agua-doce-planeja-2018.html>).

¹²⁵ NEVES, A. L. R. et al. Aspectos socioambientais e qualidade da água de dessalinizadores nas comunidades rurais de Pentecoste-CE. **Ambiente & Água - An Interdisciplinary Journal of Applied Science**, v. 12, n. 1, p. 124 - 135, 2017.

This situation makes it essential to use this 'concentrate' in order to maximize the use of a scarce resource (water) while minimizing the problems that its accumulation (of concentrate or tailings) and an improper destination of this 'concentrate' could cause¹²⁶.

Under these circumstances, the PAD recommends that tailings to be used in various ways, seeking to take advantage of the concentrate as a resource; thus, preventing it from becoming an agent of environmental degradation. PAD also proposes that the concentrate is used primarily in animal and vegetable production. The Technical Guidance Manual directs that 'tailings' be used to provide¹²⁷:

- water for animals;
- irrigation for halophyte plants (*strictu sensu* biosaline agriculture);
- fish farming.

The present Project will have the task of deploying 24 biosaline production units, which should try to combine the three uses of concentrate above. This combination should be created or designed on a case by case basis as it will depend on the availability of water/concentrate (and its characteristics) as well as the needs and preferences of families/communities.

Research already conducted in the Semiárido indicates that, in fact, the ideal combination of waste-producing activities should include the three forms of use mentioned above.¹²⁸ In addition to its own product (fish), fish farming adds a significant amount of organic matter and nutrients, which is very useful for crop production to be irrigated with the modified concentrate. However, it is known that fish farming is a very complex activity, extremely demanding in its technical management. In addition, the fish farming option requires a significant amount of water (from concentrate), which requires the well flow to be high and the desalination to work longer hours per day, which is not always possible. As a result, the vast majority of the Project's biosaline production facilities will focus on water for animals and 'biosaline' agriculture.

- Water for animals

Since animal husbandry is an important activity throughout the semiárido region and given that these animals have a tolerance to salinity (see table below), the supply of tailing water to the herd will certainly be very common in the communities in which desalination plants work.

Different documents/authors place the tolerance limit of species of animals at different levels. Thus, a recent document from the Fresh Water Program (PAD) states that beef cattle would tolerate up to 10,000 mg/l TDS, while for sheep the limit would be 12,800 and for goats 17,000 mg/l TDS. However, other sources (see table 3 below) place the limits at much lower levels. In general, waters with TDS levels between 7,000 and 10,000 mg/l should only be provided to herds (cattle, sheep and goats) in very exceptional situations.¹²⁹⁻¹³⁰⁻¹³¹

The literature states that a goat or sheep head consumes, on average, approximately 3 liters of water per day.¹³² For adult cattle, this consumption is around 50 liters/day.¹³³ Considering the hypothetical existence, in a community, of a herd of 300 head of goats and sheep plus 50 head of cattle, from the above values, it is estimated that this herd would consume approximately 3,400 liters of water daily. Assuming that there are no

¹²⁶ For instance, the high concentrations of salt turn this residue into a potential soil salinization agent.

¹²⁷ In addition to these uses in animal and vegetable production, the Manual suggests that 'concentrate' can have 'domestic use' (such as for sanitary discharges). (BRASIL-MMA-SECRETARIA-DE-RECURSOS-HÍDRICOS-E-AMBIENTE-URBANO. **Orientações Técnicas dos Componentes do Programa Água Doce para Implantação dos Sistemas de Dessalinização**. Brasília, DF: MMA - Secretaria de Recursos Hídricos e Ambiente Urbano. Available at: https://www.srh.ce.gov.br/wp-content/uploads/sites/90/2018/07/aguadoce_orientacoes_tecnicas_22jun15rev.pdf; 70 p. 2015).

¹²⁸ The Embrapa Semiárido research center - located in Petrolina, in the middle of the semiárido region of Pernambuco - has been researching, since the early 2000s, the theme of integrated production systems using 'desalination effluent' (PORTO, E. R. et al. **Sistema de Produção Integrado Usando Efluentes da Dessalinização**. Petrolina, PE: Embrapa Semi-Árido, 2004. 22 p.).

¹²⁹ ARAÚJO, G. G. L. et al. A água nos sistemas de produção de caprinos e ovinos. In: VOLTOLINI, T. V. (Ed.). **Produção de caprinos e ovinos no Semiárido**. Petrolina: Embrapa Semiárido, 2011. p.69-93.

¹³⁰ BAGLEY, C. V.; AMACHER, J. K.; POE, K. F. **Analysis of water quality for livestock**. Logan: Utah State University Extension - Electronic publishing, 1997. Available at:

https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=https://www.google.com.br/&httpsredir=1&article=1105&context=extension_histall.

¹³¹ RUNYAN, C.; BADER, J. Water quality for livestock and poultry. In: AYERS, R. S. e WESTCOT, D. W. (Ed.). **Water quality for agriculture**. Rome: FAO, 1994.

¹³² ARAÚJO, G. G. L. et al. A água nos sistemas de produção de caprinos e ovinos. In: VOLTOLINI, T. V. (Ed.). **Produção de caprinos e ovinos no Semiárido**. Petrolina: Embrapa Semiárido, p.69-93, 2011.

¹³³ PALHARES, J. C. **Estimando o consumo de água de suínos, aves e bovinos em uma propriedade** Concórdia, SC: Embrapa Suínos e Aves 2005.

other sources of water for animals in the community, the herd could consume a relatively large part of the 'waste' produced by the desalination (depending on the amount produced daily).

Table 4 A Guide to the Use of Saline Waters for Livestock and Poultry¹³⁴

Total Soluble Salts Content of Waters = (mg/l or ppm)	Comment
Less than 1,000 mg/l (1670 umhos/cm or 1.67 dS/m)	These waters have a relatively low level of salinity and should present no serious burden to any livestock or poultry.
1,000 - 2,999 mg/l (1.67-5.00 dS/m)	These waters should be satisfactory for all classes of livestock and poultry. They may cause temporary and mild diarrhea in livestock not accustomed to them, or watery droppings in poultry (especially at the higher levels), but should not affect their health or performance.
3,000 - 4,999 mg/l (5.00 – 8.35 dS/m)	These waters should be satisfactory for livestock, although they may cause temporary diarrhea or be refused at first by animals not accustomed to them. They are poor waters for poultry, often causing watery feces and (at the higher levels of salinity) increased mortality and decreased growth, especially in turkeys.
5,000 - 6,999 mg/l (8.35-11.70 dS/m)	These waters can be used with reasonable safety for dairy and beef cattle, sheep, swine and horses. Avoid the use of those approaching the higher levels for pregnant or lactating animals. They are not acceptable waters for poultry, almost always causing some type of problem, especially near the upper limit, where reduced growth and production or increased mortality will probably occur.
7,000 - 10,000 mg/l (11.70 – 16.70 dS/m)	These waters are unfit for poultry and probably for swine. With 7,000-10,000 mg/l, considerable risk may exist in using them for pregnant or lactating cows, horses, sheep, the young of these species or for any animals subjected to heavy heat stress or water loss. In general, their use should be avoided, although older ruminants, horses, and even poultry and swine may subsist on them for long periods of time under conditions of low stress
More than 10,000 mg/l - (16.70 dS/m)	The risks with these highly saline waters are so great that they cannot be recommended for use under any conditions.
35,000 mg/l - (58.45 dS/m)	Brine (sea water)

- Biosaline Agriculture

Biosaline agriculture is a broad term that describes agriculture conducted under a series of saline levels in water or soil, or a combination of both. A very important tool in the management of soils and waters affected by salt is the cultivation of plants capable of living in saline environments - halophyte plants. Many applied studies investigate the potential of halophyte species to be usefully used in arid and semiarid regions. Within a universe of approximately 2,600 known species of this type, various uses and impacts are possible. In general terms, some species have greater economic potential for human consumption, forage production, wood and raw materials (fibers, etc.); others have pronounced ecological potential due to their function in soil desalination, dune fixation, etc.

Thus, as stated above, the choice of which plants to be cultivated is what demands the most attention when it comes to biosaline agriculture. Unfortunately, many very common food crops - such as common bean (*Phaseolus vulgaris*), corn, and sesame - are quite sensitive to salinity and cannot be incorporated into a biosaline farming logic. But there is an important variety of plants that are capable of growing under saline soil and water conditions. Other plants, which some researchers call true halophytes, grow better in a saline environment than in the absence of salinity. In general, these species also allow the removal of salts from saline soils.¹³⁵

It turns out that many of the saline environment plants represent a food resource for livestock. At the lowest salinity levels (<15 dS/m), both legumes and grasses tolerant to these salinity levels are able to provide 5 to 10

¹³⁴ BAGLEY, C. V.; AMACHER, J. K.; POE, K. F. **Analysis of water quality for livestock**. Logan: Utah State University Extension - Electronic publishing, 1997. Available at:

https://digitalcommons.usu.edu/cgi/viewcontent.cgi?referer=https://www.google.com.br/&httpsredir=1&article=1105&context=extension_histall.

¹³⁵ HASANUZZAMAN, M. et al. Potential Use of Halophytes to Remediate Saline Soils. **Journal of Biomedicine and Biotechnology**, n. 2014, p. Available at: https://www.researchgate.net/publication/263845331_Potential_Use_of_Halophytes_to_Remediate_Saline_Soils 2014.

t of edible dry matter (DM) per year, particularly when the availability of water is high. At high salt concentrations (> 25 dS/m), yield levels decrease, and plant options also decrease significantly. However, even at these high salinities, there are a variety of halophyte grasses and shrubs that can produce a good amount of edible MS per year.¹³⁶

Worldwide, research is awakening to the issue of biosaline agriculture or halophyte agriculture. As has already been said, it is known that there are many plants already grown - food, fodder, wood, etc. - that have tolerance for relatively high levels of salinity. In Brazil, however, research on this topic is still quite recent. The Embrapa Semiárido research unit has been at the forefront of this field. Seeking to better understand the potential of biosaline agriculture for the semiárido region, researchers at this Center have been working on biosaline agriculture since the beginning of the 2000s. These surveys took into account the scarcity of good quality waters in the Semiárido to be used for irrigation. But the main motivation for this work was the challenge posed by the 'concentrate' of desalination plants that have been installed in the region since the 1990. The results of these surveys show that the main use of saline irrigated areas should be for forage production, taking into account the profile of the species that best develop under regional conditions (soil types, irrigation water type, etc.) and also considering the fact that ruminant breeding is an important economic activity throughout the region. An important part of this research has focused on the choice of saltgrass (*Atriplex nummular Lindl.*). In the tests carried out in the Brazilian semiárido, this shrub, originating from Australia, has allowed obtaining a very interesting production of good quality forage. In addition to this use, it is very important to highlight another feature of this plant: it absorbs a significant amount of salts from the soil, being considered a plant phytoextractor of salts^{137 138}. In this context, there is already research in Brazil on the potential of salt grass as a plant for salinized soil recovery¹³⁹.

On the other hand, there are already researches, implemented by Embrapa Semiárido and the National Institute of Semiárido (INSA), which are testing, under different salinity conditions, other plants better known to farmers, such as sorghum, palm forage, gliricidia (*Gliricidia sepium*), leucena (*Leucaena leucocephala*), and moringa (*Moringa oleifera*)^{140,141}, always considering forage production with some form of irrigation. Although none of these species behaves with the same resourcefulness shown by salt grass in high salinity situations, several of them have interesting tolerance levels, although none is what was defined above as a 'true halophyte'. These tolerant species should allow the cultivation of intercropping areas in many situations. More recent research also points to the possibility of producing seedlings of native *Caatinga* species, as the tolerance to salinity of seeds of several of these species has been proven.¹⁴²

But cultivating an irrigated plot under the conditions mentioned above requires, in addition to a careful choice of plants to be cultivated, special attention to the practices used. Some aspects stand out in this domain. The first concerns the choice of soil type: it is important to use light soils and to avoid very shallow soils¹⁴³. It is also relevant to use organic fertilizer generously. Finally, the irrigation system and management should allow crops to be supplied with only the water that is strictly necessary, and in such a way that it can be used to the fullest extent possible by cultivated plants (seeking to reduce direct soil evaporation). This causes the Fresh Water Program (PAD) to choose the localized irrigation system called 'xique-xique'.¹⁴⁴

¹³⁶ MASTERS, D. G.; BENES, S. E.; NORMAN, H. C. Biosaline agriculture for forage and livestock production. **Agriculture, Ecosystems and Environment**, n. 119, p. 234 - 248, 2007.

¹³⁷ Phytoextraction uses plants that have a high rate of salt accumulation, preferably in the aerial part, in order to facilitate their removal from the area when the plant is harvested (Pequeno et. Al. 2014, cf reference below).

¹³⁸ PEQUENO, O. T. D. L.; SILVA, J. L. B. C. D.; BRASILEIRO, I. M. D. N. Fitoextração de sais através de estresse salino por *Atriplex nummularia* em solo do Semiárido paraibano. **Revista Saúde e Ciência**, v. 3, n. 3, p. 37 - 52, 2014.

¹³⁹ Id. ibidem.

¹⁴⁰ CAVALCANTI, R. S. T.; CAVALCANTI, M. L. C.; COELHO JR., L. M. C. Manejo do solo e água com o uso da agricultura biosalina: uma nova tecnologia para o Semiárido Pernambucano. III Simposio Nacional de Estudos para Produção Vegetal no Semiárido - SINPROVS, 2018. Campina Grande, PB. Anais SINPROVS, 7 a 9 de maio de 2018.

¹⁴¹ SILVA, R. H. D. **Crescimento de palma forrageira irrigada com água salina**. 2018. 65 p. (PhD). Programa de Pós-Graduação em Zootecnia, Universidade Federal de Viçosa.

¹⁴² DANTAS, B. F. et al. Germinative metabolism of *Caatinga* forest species in biosaline agriculture. **Journal of Seed Science**, v. 36, n. 2, p. 194 - 203, 2014.

¹⁴³ SILVA, J. L. D. A. et al. Uso de águas salinas como alternativa na irrigação e produção de forragem no semiárido nordestino. **Revista Brasileira de Engenharia Agrícola e Ambiental**, v. 18, n. Suplemento, p. S66 - S72, 2014.

¹⁴⁴ The xique-xique system is a localized irrigation system for the application of water through perforated pipes, with a maximum hole diameter of 1.6 mm, with a distance of 20 cm between holes, often used in vegetable crops. For other crop types (eg fruit trees) the hole spacing will depend on the crop spacing (COELHO, E. F. et al. **Sistemas de irrigação para agricultura familiar** Cruz das Almas, BA: EMBRAPA Mandioca e Fruticultura, 2012. 7 p.).

Taking into account the above, the systems to be implemented by the Project will be inspired by those designed by the PAD. The installation of these systems should meet some minimum requirements regarding well flow and 'concentrate' production¹⁴⁵. Respecting these requirements, in the agricultural sector, an area of approximately 0.5 hectares will be installed (which may be larger if water availability permits), close to the desalination plant and with appropriate soil type. The plant should take into consideration the particular desalination nature of the cultivated area and should be under the management of the local community entity (association, etc.) that has the responsibility to take care of the mentioned equipment. This cultivated area should allow the local organization to produce and sell the fodder produced or to establish another community form of use. As we saw in the previous paragraph, a 'xique-xique' irrigation system will be installed. Following what has been researched about this topic, the main crop to be planted in this area will be saltgrass (*Atriplex nummularia*), which will have the purpose, besides producing fodder, to control soil salinity, ensuring the sustainability of the system. Following the principles that underlie the Project's Climate Resilient Production Systems (or CRPS) (see beginning of section 4 above), here too we will seek to diversify what will be planted in this plot by carefully choosing other plants that are tolerant to salinity, which occupy another stratum complementary to that of salt grass. Thus, seedlings of some *Caatinga* trees should be planted in this area, as well as gliricidia (*Gliricidia sepium*) and leucena (*Leucaena leucocephala*). The product of this irrigated parcel shall be fodder for the herd.¹⁴⁶

Proposals aiming at greater energy efficiency:

i) Eco-stoves.

The wood stove is a traditional item of homes in rural Semiarid. The facility of burning wood, the economy of gas and the special taste of the food are some of the reasons for the preference for this type of stove.

However, farming families face some difficulties in continuing to use this type of stove:

- Getting firewood has always been hard work, which traditionally falls to women. But in recent years, they have to walk further and further to gather firewood. If it is hard work to go far, it is even worse bringing the weight back home.
- Another common problem is that wood stoves emit a lot of smoke in the kitchen environment, which ends up damaging family health, especially of women who are dealing with kitchen tasks every day.
- The third problem is that the use of firewood is a factor that contributes to the deforestation of the *Caatinga*.¹⁴⁷

The efficient green stove seeks to solve those problems. There are several models of eco-efficient stoves in use in the Semiarid region, all of which work based on a better use of the heat generated by wood burning.

To illustrate and detail the above, we will take here the example of the eco-stove model that has been disseminated by the Institute for Sustainable Development and Renewable Energy (IDER). The stove is divided into a metal base, a chimney and refractory bricks that concentrate the heat in the three stove spreads and the upper plate. There are two entries with the function of inserting the wood and removing the ashes respectively. As we can see in the picture below, the hot air (in red) follows a single flow towards the burner and the chimney. The lid of the compartment where the firewood is placed must be closed during the entire period of use of the stove and should be opened only if additional firewood needs to be added to prevent the flow from going the other way.¹⁴⁸

¹⁴⁵ The Fresh Water Program Base Document states that a well with a flow rate of 3,000 L / hour and desalination operation for 8 hours a day, 7 days a week should produce sufficient amount of 'concentrate' to dissent a herd, raise fish, and irrigate a plot of 0.6 hectares.

¹⁴⁶ As previously stated (footnote 169), research conducted in the Brazilian semiarid region indicates a yield of 10.8 tons / hectare of dry matter (SILVA, J. R. R. et al. **Produção de erva-sal cultivada em diferentes espaçamentos e irrigada com rejeito de dessalinizadores no semi-árido. 46a. Reunião Anual da Sociedade Brasileira de Zootecnia**, Maringá, PR: Sociedade Brasileira de Zootecnia 2009.), which may be considered a yield compatible with many irrigated forages with non saline water (O'LEARY, J. W. A critical analysis of the use of Atriplex species as crop plant for irrigation with highly saline water. In: AHMAD, R. e SAN PIETRO, A. (Ed.). **Prospects of biosaline research**. Karachi: Karachi University, 1986. p.416 – 432; and PORTO, E. R. et al. **Sistema de Produção Integrado Usando Efluentes da Dessalinização**. Petrolina, PE: Embrapa Semi-Árido, 2004. 22 p.).

¹⁴⁷ AS-PTA. **Fogão ecológico. Pequeno manual de construção**. Esperança, PB: AS-PTA, 2014. Available at: <http://aspta.org.br/wp-content/uploads/2014/11/Manual-de-Constru%C3%A7%C3%A3o-do-Fog%C3%A3o-Ecol%C3%B3gico.pdf>.

¹⁴⁸ IDER. **Fogões ecoeficientes. Manual de construção**. Fortaleza: Instituto de Desenvolvimento Sustentável e Energias Renováveis (IDER); Associação Caatinga; Projeto Clima na Caatinga. Sem data. Available at: <http://www.terrabrasilis.org.br/ecotecadigital/pdf/fogoes-eco-eficientes-manual-de-construcao.pdf>.

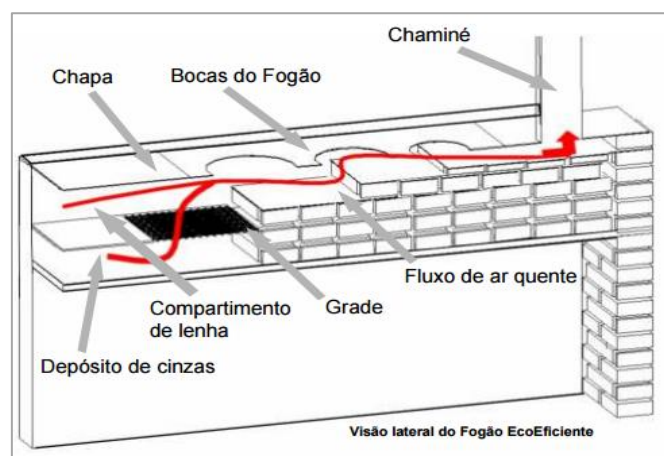


Figure 21 Eco-efficient Stove Structure.¹⁴⁹

To build an eco-efficient stove, you need to use basic construction equipment, water to wet the cement and the following materials:

- 1 iron frame with embedded plates;
- 1 3" high iron pipe (chimney);
- 1 chimney cap;
- 2 bags of 25 kg refractory cement;
- 70 10x20x5cm refractory bricks

The cost of an eco-efficient stove varies greatly depending on the type, location, etc. For instance, the estimated cost of an eco-efficient IDER stove mentioned above is approximately US\$ 200.¹⁵⁰

Since the practice of using firewood for cooking is common in the semiarid region, several agencies, public and private, have introduced eco-efficient stoves (or eco-stoves) in the region for over 15 years, seeking to reduce the consumption of firewood. The Sertão Project / Dom Helder Camara Project (funded by GEF, IFAD and MDA) was one of these projects. Thanks to its intervention, approximately 760 eco-stoves were installed in various Semiarid Territories. The People of Value Project (an IFAD partnership with the Government of Bahia) also worked with eco-stoves.



Figure 22 Stove installed and in operation.¹⁵¹

¹⁴⁹ IDER, (Sem data), as in foot-note 182 above.

¹⁵⁰ See websites: <https://tribunadoceara.com.br/noticias/ceara/familias-de-baixa-renda-da-zona-rural-receberao-do-governo-do-estado-fogoes-ecoeficientes/> e <https://www.casacivil.ce.gov.br/2011/05/04/familias-da-zona-rural-receberao-7089-fogoes-ecologicos/>.

¹⁵¹ IDER (Sem data), as in foot-note 183 above.

A study conducted within the framework of the Sertão Project mentioned here pointed out the following advantages of eco-stoves: reduction in wood consumption by approximately 55% - which provides a reduction in pressure on the *Caatinga* ecosystem -, improvement of health conditions of the family by reducing smoke emission, besides allowing a monetary saving for the family, with the reduction of the gas purchase¹⁵². This lower consumption of firewood is estimated to provide an equivalent reduction in GHG emissions.

It is worth mentioning another example of this kind of larger action in Ceará, where the Institute for Sustainable Development and Renewable Energy - IDER - supported the installation of 26,500 eco-stoves, from 2007 to 2012. There are also other such initiatives working in the Semi-arid, such as those of the NGOs AS-PTA and PATAC in Paraíba. However, the sum of these efforts still does not reach many families, and it is necessary to increase the volume and the pace of this action. Currently, eco-stoves of various models are available, including for purchase on the market. However, the cost and expertise required to install this type of stove make it necessary for an initiative like this Program to multiply the number of households with this appliance.

ii) Biodigesters

As explained in the previous section on eco-efficient stoves, unsustainable domestic use of firewood and also coal is a major cause of *Caatinga* deforestation. Many rural families have already adopted gas stoves - Liquefied Petroleum Gas or LPG, thus fossil fuel instead of renewables, due to deforestation that leads to difficulty in obtaining firewood. If before the use of wood or charcoal meant at least the autonomy of resources in the property, the adoption of LPG as an energy source has currently represented a factor of dependence on rural families in the region. The replacement of firewood and charcoal by LPG, therefore, impacts on the domestic economy and is a concern for certain families.

The implementation of biodigesters answers these questions positively. Biodigesters use manure as the raw material for biogas production. This input is produced on the property where they are installed. This maintains the family's autonomy from the main domestic fuel. In addition, simple maintenance does not compromise the other activities of the production unit. Biogas volumes, combined with its properties, meet the demand with quality and efficiency.

The Sertão Project (GEF-FIDA-MDA) and other action organizations for sustainable development also worked with the installation of biodigesters. These equipments are not new in Brazil. They were introduced to the country based on models from China and India. The model used by various entities (including Project Sertão and the NGO Diaconia), nicknamed Sertanejo Biodigester, is inspired by the Indian model but adapted to the reality of the Brazilian Semi-arid Region.¹⁵³

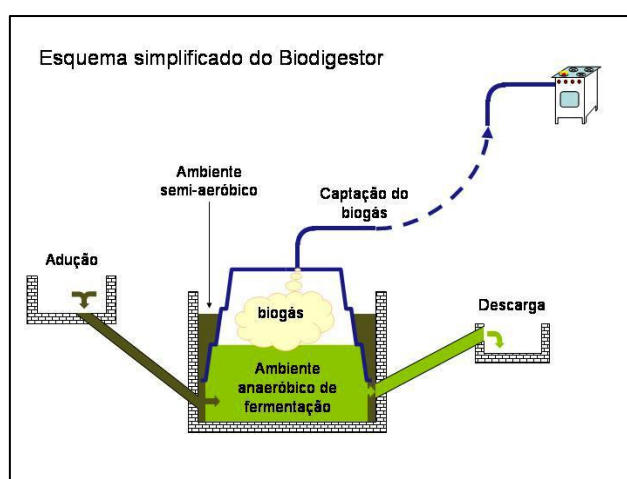


Figure 23 Schematic representation of the Sertanejo Biodigester¹⁵⁴

¹⁵² REGUEIRA, T. M. Comparação entre a eficiência de dois modelos de fogão a lenha e seus impactos sobre ao desmatamento da caatinga. 2010. 26 p. Monografia (Bacharelado em Ciência Biológicas com ênfase em Ciências Ambientais). Centro de Ciências Biológicas, UFPE, Recife, PE.

¹⁵³ MATTOS, L. C.; FARIAS JR, M. **Manual do biodigestor sertanejo**. Recife: Projeto Dom Helder Camara, 2011. 55 p.

¹⁵⁴ MATTOS, L. C.; KREHBIEL, J. Impacto de um biodigestor domiciliar na economia de emissões de gases de efeito estufa em uma propriedade da agricultura familiar do Cariri Paraibano. In: FARIAS SEABRA, G.; NOVAES DA SILVA, J. A., *et al* (Ed.). **A Conferência da Terra: Aquecimento global, sociedade e biodiversidade**. João Pessoa, PB: Editora Universitária da UFPB, v.III, 2010. p. 315 - 323.

As can be seen from figure 20, the Biodigester Sertanejo is composed of three main parts: in a first adduction box or load, the manure mixed with water is placed. Fermentation of the biogas-producing manure (biomass) takes place in a circular tank made of cement slabs that are covered with a capsized 3,000-liter fiberglass box through anaerobic digestion of bacteria, resulting in biogas production. From the discharge box comes the nutrient-rich biofertilizer and organic fertilizer, the end result of fermentation of animal manure. The biogas is stored in the fiberglass box, where it is led by hoses to the kitchen of the house¹⁵⁵.



Figure 24 Sertanejo Biodigester¹⁵⁶

This equipment has generated benefits for families, such as the financial savings by reducing the purchase of cooking gas, reducing the work with firewood collection, improving the kitchen environment and, therefore, having positive health effects by reducing or eliminating the smoke generated by the burning of firewood and charcoal, as well as the reduction in the emission of greenhouse gases from the burning of LPG, firewood and coal. Mattos and Krehbiel survey data indicate that GHG emissions from the cooking activity of a typical Cariri Paraibano farming family can range from 1586 to 4348 kg CO₂Eq/year, depending on the type of fuel used. After the installation of the biodigester, these values are reduced to a range of 172 to 750 kg CO₂Eq/Year. This represents a 50% to over 1000% reduction in GHG emissions¹⁵⁷.

Water harvesting, storage and management

The Project will work with various technologies for water collection and storage, mainly for their use in agricultural production.

In terms of the technical proposals to accomplish this task, the Project will be based on the best practices that have been developed in Brazil's Semiarid during the last two decades. In this domain, the most important reference is the *1 Terra e 2 Águas* (P1 + 2) Program, implemented by ASA (Articulation of the Brazilian Semiarid) / AP1MC, in partnership with several agencies/entities, most notably MDS, BNDES, Banco do Brasil Foundation, among others. The main proposals to be used, already cataloged as Social Technologies by the Banco do Brasil Foundation¹⁵⁸, are the boardwalk (or *calçadão*) cisterns, the underground dams, the trench barriers, and the graywater reuse system. The project will also work on the proposal for a 'green pit'.

- 'Calçadão' Cistern

¹⁵⁵ See website: <http://tecnologiasocial.fbb.org.br/tecnologiasocial/banco-de-tecnologias-sociais/pesquisar-tecnologias/detalhar-tecnologia-327.htm>.

¹⁵⁶ MATTOS, L. C.; FARIAS JR, M. **Manual do biodigestor sertanejo**. Recife: Projeto Dom Helder Camara, 2011. 55 p.

¹⁵⁷ MATTOS, L. C.; KREHBIEL, J. Impacto de um biodigestor domiciliar na economia de emissões de gases de efeito estufa em uma propriedade da agricultura familiar do Cariri Paraibano. In: FARIAS SEABRA, G.; NOVAES DA SILVA, J. A., et al (Ed.). *A Conferência da Terra: Aquecimento global, sociedade e biodiversidade*. João Pessoa, PB: Editora Universitária da UFPB, v.III, 2010. p. 315 - 323.

¹⁵⁸ See website: <http://tecnologiasocial.fbb.org.br/tecnologiasocial/principal.htm>

The boardwalk (or *calçada*) cistern technology consists of a 200m² cemented space (the 'boardwalk') for rainwater harvesting, coupled with a reservoir or cistern, usually built with cement slabs, with a capacity of 52,000 liters of water.

The boardwalk cistern is a type of cylindrical water reservoir usually made of covered and semi-buried concrete slabs that allow rainwater to be captured and stored from a cemented catchment area or 'boardwalk'. The 3.2 m radius 1.8 m deep reservoir can hold approximately 52 m³ of water. As it is covered and enclosed, the water stored in it is protected from evaporation and contamination caused by animal waste and other impurities brought by the wind.

The rainwater harvesting area, called the boardwalk, consists of a cemented area of 200 m². Its area is bounded by a curb, and it is on a higher plane than the reservoir, with a small slope to lead the water to a settling box and thence to the reservoir.

This tank has the purpose of capturing and storing water for the production of food, medicinal plants and small animal breeding, thus enhancing the productive backyards.

The estimated value for implementing a boardwalk cistern is approximately US \$ 2,000.00. This includes the costs of building materials, the contribution given to the beneficiary family to the mason's payment and the materials for the enhancement of productive backyards¹⁵⁹.



Figure 25 Rainwater harvesting and storage boardwalk with its 52,000-liter cistern.¹⁶⁰

P1 + 2 proved to be very successful in terms of adopting effective water collection and storage techniques for production, and also in training farmers to better manage this precious resource. Until November 2018, P1 + 2 installed more than 101,000 production tanks in the various states of the Semiarid. Of these, over 23,000 were built in the semiarid region of the state of Bahia alone.

There are studies that speak about the results obtained in the implantation of this social technology. Thus, research jointly conducted by INSA and ASA showed that the implementation of domestic and especially production ('boardwalk') cisterns positively affected household economies, as demonstrated by an economic analysis in Cariri, Paraíba. This analysis compared household economies before and after accessing water infrastructure. It was found that, with the presence of DC (domestic cisterns) and PC (production cisterns), families obtained 3.3 times higher profitability than without technologies, in terms of gross and agricultural

¹⁵⁹ Retrieved at: <http://tecnologiasocial.fbb.org.br/tecnologiasocial/banco-de-tecnologias-sociais/pesquisar-tecnologias/cisterna-calçada-para-potencializacao-de-quintais-produtivos.htm>.

¹⁶⁰ This photo was taken by a member of the Project design team.

income¹⁶¹. A second survey, conducted in the municipality of Jardim, Cariri Cearense, reached similar conclusions. There was a significant difference favorable to the group of beneficiaries of the P1 + 2 Program compared to non-beneficiaries, both in terms of a Quality of Life index and household income. Considering the average annual agricultural income of beneficiaries and non-beneficiaries, a difference of almost 60% was found in favor of the former¹⁶².

- Underground Storage

Although it was identified by Guimarães Duque, as early as 1950, as a very promising technology¹⁶³, until recently the underground dam was little known to the backcountry population. Over the last two decades, this type of dam has begun to spread across the Northeast.

The underground dam - built on an alluvial terrace perpendicular to the streambed - is intended to block subsurface runoff from the alluvial aquifer (see Figure 27 below). The use of underground dams in the semiarid region is justified by the climate and hydrological regimes of the region. Almost all rivers in the Semiarid are temporary and remain dry for most of the year. However, after a short-term flood (a few days), subsurface runoff continues for several weeks or even several months, depending on the size of the catchment area, until it runs out during the dry season. Under these conditions, the implementation of underground dams makes it possible to block the flow and, consequently, raise the piezometric level of the groundwater. Thus, the farmer can then use this water in two ways: through shallow wells/wells and through the plants grown there. Thus, as water is withdrawn from the ground of the underground dam (via waterfall, plants or evaporation), runoff continues, and the alluvial aquifer is continuously fed back by water flowing from the basin upstream of the dam. The system behaves like a sponge from which water is slowly drawn downstream. Under ideal soil conditions, with a sufficiently large catchment area and, of course, a satisfactory amount of rainfall, this system should allow drought to pass through soil water for plants and well water for other types of consumption.¹⁶⁴

The underground dam is any structure that aims to block the flow of rainwater from the surface into the ground by constructing an impermeable wall installed transversely to the direction of water flow. This wall can be composed of compacted clay, masonry, concrete or plastic tarp, depending on the producer's local conditions and the availability of materials in the region. However, the 200-micron polyethylene plastic tarpaulin has been widely used, because, with its use, construction is faster and more economical.

The rainwater accumulation results in the elevation of the water table, which is close to the root system of the plants, favoring their access to soil with adequate moisture. In some situations, in years with above-average rainfall in the region, the excess water passes through the drainage, functioning as an ebb. The underground dam allows the accumulated water in the ground to supply the well built in the dam (Figure 27). This is because of the elevation of the water table. This water can be used for various purposes, especially in the driest time of the year, allowing small irrigation of fruit and vegetables. Often this water is also used for human and animal consumption.¹⁶⁵

¹⁶¹ ASA-BRASIL. **Programa Uma Terra e Duas Águas (P1+2). Síntese dos Estudos de Caso do Território de Atuação do Coletivo Regional das Organizações da Agricultura Familiar do Cariri, Curimataú e Seridó Paraibanos**. Recife, PE: ASA-Brasil; 26 p. 2016, apud PÉREZ-MARTIN, A. M. et al. Agroecological and Social Transformations for Coexistence with Semiaridity in Brazil. *Sustainability*, v. 9, n. 6 (990), 2017. Available at: <https://doi.org/10.3390/su9060990>.

¹⁶² ALENCAR, M. D. O.; JUSTO, W. R.; ALVES, D. F. Os efeitos do Programa "Uma Terra e Duas Águas" (P1+2) sobre a qualidade de vida do pequeno produtor rural do Semiárido nordestino. *Revista Econômica do Nordeste*, v. 49, n. 1, p. 165 - 180, 2017.

¹⁶³ GUIMARÃES DUQUE, J. *Solo e água no Polígono das Secas*. 5a. edition. Mossoró: Fundação Guimarães Duque, 1980.

¹⁶⁴ GRIMAUD, J. *As barragens subterrâneas. Estudo de caso num município do Sertão pernambucano*. Unpublished work: 12 p. 2002.

¹⁶⁵ MELO, R. F. D. et al. *Barragem Subterrânea: Tecnologia para Armazenamento de Água e Produção de Alimentos*. *Circular Técnica*, 104. Petrolina, PE: Embrapa Semiárido, 2013. Available at: www.cpatas.embrapa.br.

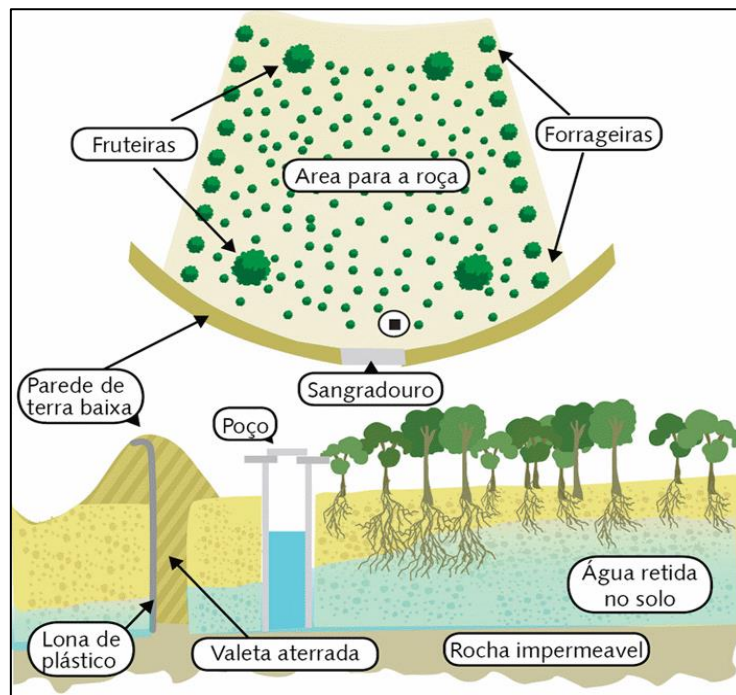


Figure 26 Schematic drawing of the underground dam operation ¹⁶⁶

The costs of underground dams are extremely variable, depending on the size (length and depth of the bus), as well as the way the work is done and even the form of funding. A survey conducted in Mirandiba (PE) in 2000 found out costs ranging from US\$ 500 to US\$ 1,000 that roughly corresponded to the average price of a small clay pit, which takes 20 to 70 machine working hours. The cheapest dams were, of course, the smallest, the deepest, and the one without a bucket. The most expensive were the dams that required a large volume of excavation (over 40 meters long and over 3 meters deep). A second survey, which was based on a Pernambuco Government's BS construction policy that ran from 2010 to 2015, reached higher values per dam built, ranging from US\$ 1,500 to US\$ 3,800.00.¹⁶⁷

The most significant effect of the underground dam is the possibility of economic use. In the upstream alluvial soil patch, various crops can be cultivated as moisture is available to plants all year round. In the case of an area of the Cangati River micro basin (Ceará), in the first underground dam built, elephant grass was cultivated. In 'normal' rainy years, this grass stays green all year round and is available for feeding. In other cases, beneficiary families have been able to harvest food such as beans, corn, cassava and various fruit trees. But despite all these advantages, it is important to remember that the benefit of the underground dam for farming families is directly dependent on the amount of rainfall of a given rain cycle. Thus, during the last major drought, many of these dams did not produce for several years.

¹⁶⁶ SOUSA, T. et al. Barragem subterrânea: Tecnologia sustentável de captação, armazenamento de água e convívio com o Semiárido. **Revista Terceiro Incluído**, v. 4, n. 1, p. 97 -103. Available at: <https://doi.org/10.5216/teri.v4i1.33949>, 2014.

¹⁶⁷ COSTA, W. D.; COSTA, W. D. J. **Barragens subterrâneas e barragens de assoreamento. Conceitos e construção**. Recife, PE: Editora UFPE, 2015. Available at: <http://www.creape.org.br/portal/wp-content/uploads/2016/11/Caderno%203%20Barragens%20Subterr%C3%A2neas%20e%20de%20Assoreamento.pdf>.



Figure 27 Waterproof tarpaulin installation of an underground dam under construction ¹⁶⁸

- Gray water reuse system

Among the challenges towards the culture of coexistence with the Semi-arid, water is increasingly emerging as a limiting factor, due to the condition of semi-dryness, coupled with local anthropic interference (such as pollution of springs, rivers and groundwater, erosion and deforestation) and globally (as the causes of climate change), making water a scarce natural resource for the growing need for human activities.¹⁶⁹

Thus, in the Northeastern Semi-arid, the availability of water is always a matter of intense concern. However, it is quite common in rural backcountry to see that gray waters¹⁷⁰ are being wasted. In the backyards in the interior of the Semi-arid, it is observed that these waters are released into the open, even in homes that have some treatment for a part of domestic effluents, such as the septic tank. Thus, untreated gray water contaminates the soil and water and causes disease to the animals that ingest it.¹⁷¹

This scenario points to the need to adopt measures for the proper use and reuse of water and to control pollution of water resources - in particular by gray waters - as a way of ensuring water current and future availability. Treated gray water should be considered as a water resource to be used for various purposes. Water reuse is a practice to be encouraged in multiple human activities, especially in agriculture, as a way of recycling nutrients and water, reducing negative environmental impacts on water bodies and soil by effluent discharge, among others.¹⁷²

In this context, the reuse of water offered by the Family Biowater System - SBF - fills a fundamental gap, as it is low cost and takes advantage of local capacities for its implementation, management and maintenance. It provides a unit for the treatment of gray water and subsequent use in the production of high nutritional value food for families and backyard animals. It also propitiates learning agroecological principles in practice, especially soil management, water management, agrobiodiversity and nutrient cycling, which are applicable to other areas of family-run agroecosystems.¹⁷³

¹⁶⁸ MELO, R. F. D. et al. **Barragem Subterrânea: Tecnologia para Armazenamento de Água e Produção de Alimentos**. Circular Técnica, 104. Petrolina, PE: Embrapa Semiárido. Available at: www.cpatsa.embrapa.br 2013.

¹⁶⁹ SANTIAGO, F. et al. **Manual de implantação e manejo do sistema de Bioágua Familiar. Reuso de água cinza doméstica para a produção de alimentos na agricultura familiar do semiárido brasileiro**. Caraubas, RN: ATOS, 2015. 190 p. Available at: https://bioaguafamiliar.files.wordpress.com/2015/09/manual_bioagua_familiar_2015.pdf.

¹⁷⁰ Graywater is defined as all sewage generated in a dwelling except that from the sanitary basin. It therefore includes effluents from the shower, washbasin, kitchen sink, tank and / or washing machine (BORGES, L. Z. Caracterização da água cinza para promoção da sustentabilidade dos recursos hídricos. 2003. 103 p. Dissertação – Mestrado em Engenharia. Universidade Federal do Paraná. Curitiba, 2003).

¹⁷¹ DOS SANTOS FILHA, M. E. C.; ARAÚJO, M. T. L. **Aspecto para implantação de sistemas de reuso de águas cinzas em comunidades rurais no Estado do Ceará – estudo de caso: Projeto São José III**. VI Simposio de Economia Rural: Políticas Públicas e Geração de Renda no Nordeste Rural. Fortaleza: 15 p., 2018. Available at: <https://simpoer.ortal.br/wp-content/uploads/2018/10/PSJ-Reuso-de-%C3%A1guas-cinzas.pdf>.

¹⁷² SANTIAGO, F. et al. **Bioágua Familiar. Reuso de água cinza para produção de alimentos no Semiárido**. Recife: Projeto Dom Helder Camara-SDT-MDA, 2012. 19 p.

¹⁷³ SANTIAGO, F. et al. **Manual de implantação e manejo do sistema de Bioágua Familiar. Reuso de água cinza doméstica para a produção de alimentos na agricultura familiar do semiárido brasileiro**. Caraubas, RN: ATOS, 2015. 190 p. Available at: https://bioaguafamiliar.files.wordpress.com/2015/09/manual_bioagua_familiar_2015.pdf.

The Family Biowater System (FBS) is newly created. It was from 2009 onwards that the Sertão - PDHC Project (FIDA - GEF - MDA) established a partnership with three farming families, an NGO and the Federal University of Semiárido (UFERSA) to develop an appropriate graywater treatment system to the specific conditions of the northeastern semiárido family farmers. After more than three years of work, this system has been validated and has been called 'family biowater'. Although other graywater treatment systems are available and are being implemented in several states in the region, the Project will prioritize working with this proven system of family biowater.

The technology for reusing water from Family Biowater is a process of filtering through mechanisms of physical and biological impediment of the waste present in gray water, and organic matter is biodegraded by a population of microorganisms and earthworms (*Eisenia foetida*). The removal of the main pollutants found in these waters occurs with the digestion and absorption of the organic matter retained in the water by the worms. Reuse water is used in a closed irrigation system for the production of vegetables, fruits, medicinal plants and other types of food.

Household gray water production varies with family size, water supply and other factors. The SBF proposes that this treated water to be reused in agricultural production. This system consists of the following components: i) plumbing that carries the gray water from the house through the other components; ii) 'grease box' (which serves to remove thicker impurities); iii) biological filter (including earthworms); iv) reuse tank (to store filtered water); v) earthworm (where the worms used in the filter are created); vi) irrigation system; vii) fenced area to protect the flower beds and nurseries where crops are grown.

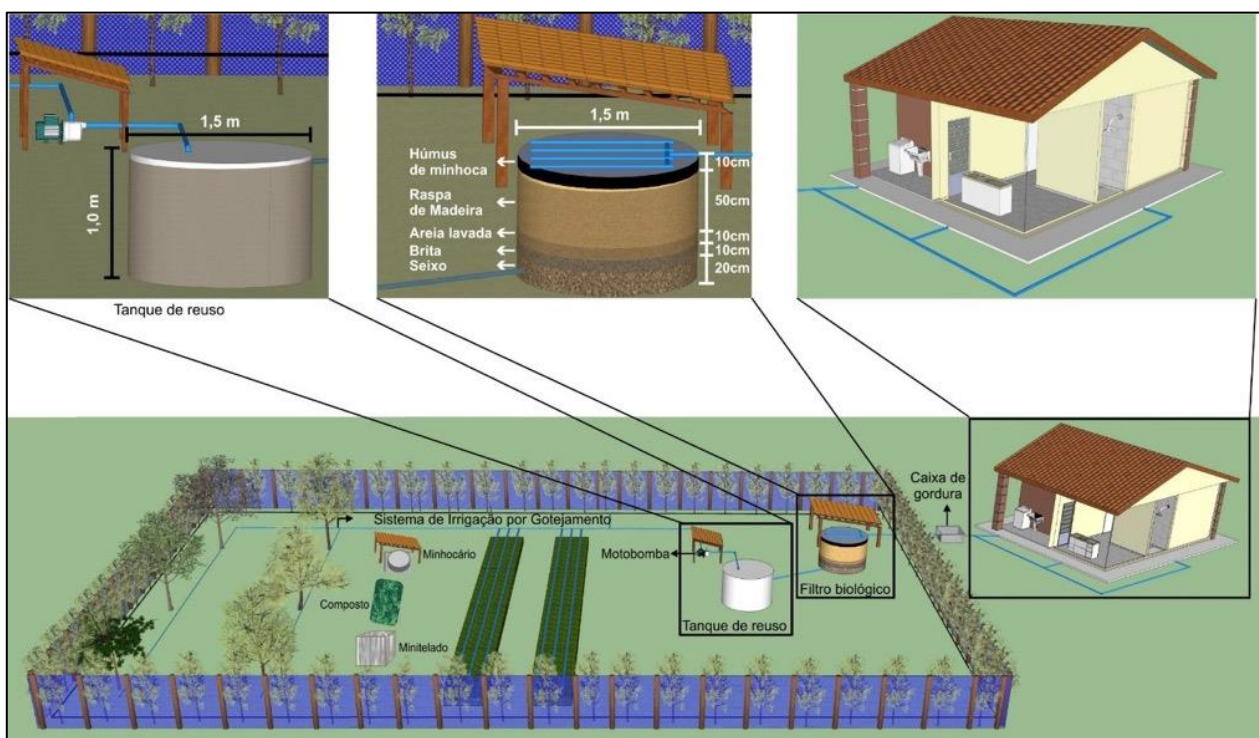


Figure 28 Sketch showing the different components of the Family Biowater System ¹⁷⁴

Data collected during the years of experimentation with the FBS showed that a country house with 4 to 5 people 'produces' approximately 500 liters of 'graywater' per day. The proposed biological filter in the system was designed to treat this quantity. The treated water is used to irrigate an agroforestry yard, with crop beds, and various types of trees. The total area planned for this 'yard' is approximately 300 m². The irrigation system must be a drip.

¹⁷⁴ SANTIAGO, F. et al. **Bioágua Familiar. Reuso de água cinza para produção de alimentos no Semiárido.** Recife: Projeto Dom Helder Camara-SDT-MDA, 2012. 19 p.

The FBS Implementation and Management Manual estimated the cost of a complete system at approximately \$ 2,600.¹⁷⁵



Figure 29 Biological filters from Family Biowater System, with plumbing bringing gray water from the house. In this case, the graywater 'production' is significant, justifying the double filter¹⁷⁶

- Green septic tank – Simple system for blackwater treatment

The rural Northeast, and thus the semiarid region, suffers from a chronic sanitation deficit. It is estimated that only about 10% of rural households in the Northeast have access to adequate sanitation¹⁷⁷.

Lack of proper treatment of domestic sewage - especially blackwater –¹⁷⁸ creates considerable health problems for the population concerned. Given this situation, it is evident the need to identify alternatives that are socially, economically and ecologically sustainable, to address the problem of proper disposal of domestic sewage (especially blackwater - as we will see below) in rural areas. Thus, it is urgent to find appropriate solutions to the reality of rural communities and settlements, which contemplate the particularity of the countryside, ensuring the health of the population and the environment.¹⁷⁹

There are basically two variants of sewage systems: the collective system (which means removing sewage from the served areas) and the individual type system (which represents a solution on-site, individual or for a few households).¹⁸⁰ The green septic tank fits into the individual system category, usually serving single-family homes.¹⁸¹ It is also associated with the latest ecologically focused solutions, which, in addition to presenting a solution to health threats, are also concerned with the reuse of the nutrients and water contained in these effluents.¹⁸²

The green septic tank, also called a bio septic bed, consists of the construction of a waterproofed trench of varying dimensions, featuring an internal pyramidal chamber structure made of ceramic bricks (8-hole), where

¹⁷⁵ SANTIAGO, F. et al. **Manual de implantação e manejo do sistema de Bioágua Familiar. Reuso de água cinza doméstica para a produção de alimentos na agricultura familiar do semiárido brasileiro.** Caraubas, RN: ATOS, 2015. 190 p. Available at: https://bioaguafamiliar.files.wordpress.com/2015/09/manual_bioagua_familiar_2015.pdf.

¹⁷⁶ This photo was taken by a member of the Project design team.

¹⁷⁷ Data available at: <http://www.funasa.gov.br:8080/web/guest/panorama-do-saneamento-rural-no-brasil>.

¹⁷⁸ In the composition of domestic sewage, it is possible to differentiate between blackwater and graywater. Blackwaters are those excreted from toilets, containing urine and feces, and need specific treatment to reduce pathogens. Graywaters are those from sinks, showers and laundries, which can be reused (OLIVEIRA, G. D. D. et al. Tratamento domiciliar de águas negras: tanque de evapotranspiração. **Revista Petra**, v. 4, n. 2, pp. 194 - 214, 2018). The family biowater system, object of the previous section, is suitable for graywaters.

¹⁷⁹ ARAÚJO, J. C. **Biorremediação vegetal do esgoto domiciliar em comunidades rurais do semiárido: “Água limpa, saúde e terra fértil”.** Departamento de Engenharia Agrícola – UFC, 2012. Available at: <https://www.passeidireto.com/arquivo/24120781/biorremediacao-vegetal-do-esgoto-domiciliar-em-comunidade-rurais-do-semiarido>.

¹⁸⁰ VON SPERLING, M. **Introdução à qualidade das águas e ao tratamento de esgoto.** Belo Horizonte, MG: DESA / UFMG, 2005.

¹⁸¹ OLIVEIRA NETTO, A. P. et al. Biorremediação vegetal do esgoto domiciliar: o caso da fossa verde em comunidades rurais do Alto Sertão alagoano. **Revista Produção e Desenvolvimento**, v. 1, n. 3, p. 103 - 113, 2015.

¹⁸² SOUZA, L. S.; SATIRO, A.; PRADO, C. Tratamento de água negra domiciliar através de bananeiras por Tanque de Evapotranspiração. **Atas de Saúde Ambiental**, v. 6, n. Jan-Dez 2018, p. 235 - 248, 2018.

the holes are sloped into approximately 30° and open to the space filled with filter material¹⁸³ (see Figure 31 below).

The edges of the pit or tank should exceed ground level by at least 10 cm to limit rainwater infiltration. The dimensions of this ditch depend mainly on the volume of blackwater to be treated. This, in turn, depends mostly on the number of people living in residence. It is recommended that the pit or ditch be from 1.20 to 1.50 m deep, 2 m wide, and, for the length, 1 m for each person living in residence.¹⁸⁴

The sewage is directed into the chamber and then flows out of this structure, filled with porous filtering materials such as debris or coconut shell. The last layer of the surface is composed of earthy material, where plants such as banana, *taio* or others are grown (see Figures 31 and 32 below). The effluent treatment in the pit takes place in an upward flow allowing organic solids to be in maximum contact as the support material, which is one of the key points for biomass retention. The sewage is discharged at the base of the foundation, resulting in the formation of microbial sludge that extends along with the support material.¹⁸⁵

Anaerobic digestion, which occurs in the chamber, decomposes organic matter from household waste in conjunction with the action of aerobic microorganisms in the root zone of plants. The water is evapotranspiration and used consumptively by the vegetation. This means that the system does not generate effluents to be infiltrated into the soil or sent to another after treatment.¹⁸⁶ It should be remembered here that, when properly sized, this system removes polluting elements from the environment, and there is no danger of them coming back to cause damage. Thus, the main advantage of this alternative system is that it provides adequate disposal of domestic wastewater, which is often deposited in the open, facilitating the proliferation of insects and rodents and spreading pathogenic vectors, thus harmful to the environment and health of the population.¹⁸⁷

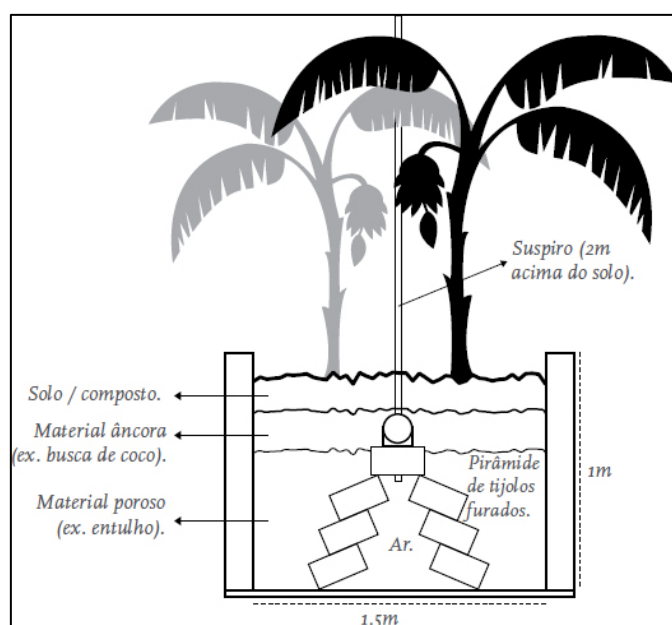


Figure 30 Green septic tank (or Bioseptic bed) sketches ^{188;189}

¹⁸³ In some green septic tank models this chamber is formed by an alignment of used tires replacing the pyramid chamber. (GALBIATI, A. F. **Tratamento domiciliar de águas negras através de tanque de evapotranspiração**. (Dissertação de Mestrado). Centro de Ciências Exatas e Tecnologia, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, 2009).

¹⁸⁴ FIGUEIREDO, I. C. S.; SANTOS, B. S. C.; TONETTI, A. L. **Tratamento de esgoto na zona rural: fossa verde e círculo de bananeiras**. Campinas, SP: Biblioteca/Unicamp, 2018. 28 p.

¹⁸⁵ GALBIATI, A. F. **Tratamento domiciliar de águas negras através de tanque de evapotranspiração**. (Dissertação de Mestrado). Centro de Ciências Exatas e Tecnologia, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, 2009

¹⁸⁶ COELHO, C. F.; REINHARDT, H.; ARAÚJO, J. C. Fossa verde como componente de saneamento rural para a região semiárida do Brasil. **Engenharia Sanitária Ambiental**, v. 23, n. 4, p. 801 - 810, 2018.

¹⁸⁷ ARAÚJO, J. C. **Biorremediação vegetal do esgoto domiciliar em comunidades rurais do semiárido: “Água limpa, saúde e terra fértil”**. Departamento de Engenharia Agrícola – UFC, 2012. Available at: <https://www.passeidireto.com/arquivo/24120781/biorremediacao-vegetal-do-esgoto-domiciliar-em-comunidade-rurais-do-semiarido>.

¹⁸⁸ See website: <http://institutoecoacao.blogspot.com/2013/10/veja-como-construir-uma-fossa-ecologica.html>.

¹⁸⁹ WIEGAND, M. C. **Fossa Verde: tecnologia de saneamento rural**: Sem data. Available at: http://aprece.org.br/wp-content/uploads/2017/08/aprece-associacao-dos-municipios-do-estado-do-ceara_aprece_fossa-verde.pdf.

This process falls into the category of plant bioremediation and emerges as an alternative for household wastewater treatment, in which the waters and nutritional compounds from sewage are reused by plants. This proposal is already being implemented in the Semi-arid region. This is the case, for example, of the 25 de Maio Settlement, in the municipality of Madalena, in Ceará's Central Sertão, where a group from the Federal University of Ceará implemented and accompanied 70 of these units for three years. This experience was inspired by a previous one, held in the city of Icapuí, also in Ceará.

The follow-up carried out by the university allowed the crops produced in the green pits (banana, tomato, pepper, etc.) to be submitted to microbiological analysis and the results indicated that they are of satisfactory sanitary quality, therefore, fully fit for human consumption. In addition, this same initiative showed that the cost of building this alternative system is reduced compared to the conventional septic tank, of around US\$ 300 per unit, and its operation and maintenance are simple and consistent with the reality of rural populations.¹⁹⁰



Figure 31 Step by step construction of green septic modules in the Paus Broncos community, Settlement May 25th, Ceará.¹⁹¹

4.3 Detailed description of Project framework and activities

4.3.1 Project's objectives

Climate stressors (see section 2.4) aggravate the cycle of deterioration caused by improper practices, which translates into a decline in productivity, which in turn fuels social and environmental degradation processes, inducing impoverishment of family farmers and ecosystem services.

The Planting Resilience in Rural Semi-arid Communities Project will work to change the paradigm, postulating that it is possible to transform the productive systems of family farmers in the Semi-arid, increasing production while improving their ability to meet the challenges posed by the climate change.

¹⁹⁰ COELHO, C. F.; REINHARDT, H.; ARAÚJO, J. C. Fossa verde como componente de saneamento rural para a região semiárida do Brasil. *Engenharia Sanitária Ambiental*, v. 23, n. 4, p. 801 - 810, 2018.

¹⁹¹ ARAÚJO, J. C. *Biorremediação vegetal do esgoto domiciliar em comunidades rurais do semiárido: "Água limpa, saúde e terra fértil"*. Departamento de Engenharia Agrícola – UFC, 2012. Available at: <https://www.passeidireto.com/arquivo/24120781/biorremediacao-vegetal-do-esgoto-domiciliar-em-comunidade-rurais-do-semiarido>

Thus, the Project will have as its primary objective to strengthen the resilience of poor and extremely poor rural families in the Brazilian semiarid region, through the establishment of more sustainable and productive agricultural systems that promote greater vegetal coverage of the area and perform their other ecosystem functions correctly, which in turn will increase and stabilize household income and food security, encouraging young generations to remain active in rural activities.

In order to mitigate the risks and bottlenecks faced by semiarid farming families in their primary production activities (agriculture, animal husbandry, extractivism), the Project will work with two strands that will seek at the same time to strengthen productive capacity and most resilient. The first strand will focus on implementing more productive and resilient systems in the face of climate change challenges (CRPS). The second will seek to develop the capacity of households to collect and store water, which should also allow them to expand their productive capacity. The third component will scale-up component 1 and 2 throughout the region and to other drylands through south-south cooperation.

4.3.2 The intervention area and target audience

The targeting strategy will prioritize areas with higher climate, socioeconomic and environmental vulnerability. The selection criteria will be applied in the following sequence:

Selection of the States. The Project will work in the Northeastern semiarid region. Approximately three Northeastern states will be selected, and preference will be awarded to states with past IFAD projects. Eligible states will present projects to the Executing Entity (EE), BNDES, including information on governance arrangements, targets, as well as compliance with applicable legislation. The selection process will be based on client qualification, verifying borrowing capacity and implementation arrangements, as well as project analysis with predefined criteria (presented in PIM Annex 21).

Project area. Once the states are chosen, the Project intervention area must be defined. The municipalities will be ranked, within each of the selected States, through an analysis considering the following criteria:

- (i) rural poverty incidence;
- (ii) climate vulnerability index and historical exposure to drought;
- (iii) food and nutritional security index;
- (iv) water quality and availability.

Territorial contiguity will also be considered when drawing up the final list, since the proximity between municipalities and communities facilitates the exchange of experiences between farmers in the processes of experimentation, in addition to enabling greater efficiency in the performance of operations by the States.

Rural Advisory Services providers will be selected per area, with one extension advisor serving an average of four communities (in total about 140 families) for 3 years (for Component 1 activities) or 2 years (for Component 2 activities).

Selection of beneficiary groups. Within the selected target municipalities, the project will focus on families and communities with the highest climatic, socioeconomic and environmental vulnerability. The project will work with family farmers who have agricultural establishments or live in agrarian reform settlements,¹⁹² and who are at greatest risk of being pushed into conditions of extreme food insecurity due to climate change. The following selection criteria will be applied:

- (i) the environmental precariousness of properties/farms (signs of deforestation, erosion and soil degradation);
- (ii) food and nutritional insecurity (malnutrition and chronic-degenerative diseases);
- (iii) tangible effects of drought and level of access to quality water.

The process of selecting communities and families will be defined by each State, following minimum qualifying principles set forth in the Project Implementation Manual (PIM). There will be an effort to ensure

¹⁹² Law number 11.326/2004, defines family farmers based on four criteria: (i) they must have an area of up to 4 fiscal modules; (ii) must have a minimum family income deriving from rural economic activities developed in his/her property; (iii) must predominantly use their own family labor force in rural economic activities; (iv) must manage their venture with their family. The family agriculture segment is integrated by agrarian reform settlers, *quilombola* communities, indigenous peoples, artisans, fisherman, among others.

the inclusion of the most marginalized and priority groups (women, youth, traditional communities, afro-descendent and indigenous peoples) in numerical terms and to adopt a flexible and responsive approach to their particular demands and needs.

Participation will not be mandatory. Thus, public awareness campaigns and stakeholder engagement (Annex 7 of the Funding Proposal) will be necessary. For indigenous communities, the project will also follow the FPIC plan (as per Annex 6 of the Funding Proposal).

The national Unified Registry (*Cadastro Único*)¹⁹³ – the main instrument for the selection and inclusion of low-income families in federal government programs – will be the primary tool used to identify families living in social vulnerability. Some complementary sources of information will also be accessed for the selection of municipalities, communities and families:

- (i) MAPAINSAN was a study developed by the MDS in 2014 with the objective of identifying families and individuals that are in situations of food and nutritional insecurity and the National System of Food and Nutrition Surveillance – SISVAN data;
- (ii) Database of the National Commission to Combat Desertification and Mitigate the Effects of Drought (CNCDD) and subsidies of the Warning System Tools for early detection of Drought and Desertification, designed to predict droughts in the semiarid regions in Brazil nowadays;
- (iii) the municipal Human Development Index (HDI), a measure comprised of three indicators of human development dimensions: longevity, education and income;
- (iv) the IVS (Social Vulnerability Index), designed from indicators of the Human Development Atlas in Brazil.

The inclusion of socioeconomic variables in the prioritization process reflects the fact that the Project assumes there is a direct relationship between the sources of vulnerability to climate change and poverty: the poorest members of the population are considered to have the lowest ability to invest in diversifying their livelihoods so as to reduce their exposure to climate change impacts, and least access to social and financial safety nets. These characteristics make them the most vulnerable to climate change. For this reason, the Project provides maximum concessionality in that part of the GCF support.

4.3.3 PCR General Project Structure

The implementation of the PCR Project will be carried out through two main components - Component I - Climate Change Resilient Productive Systems and Component II - Water Access. This will be designed through the Territorial Resilience Investment Plans (TRIPs). Complementary cross-cutting activities in capacity and awareness building, knowledge management, south-south cooperation, public policy dialogue, monitoring and evaluation - grouped in Component III - will complement to reach the project's objective.

¹⁹³ Are allowed to register: (i) families with monthly income of up to half a minimum wage per person; (ii) families with income higher than three minimum wages, provided that register is linked to the inclusion in social programs from the three governmental levels.

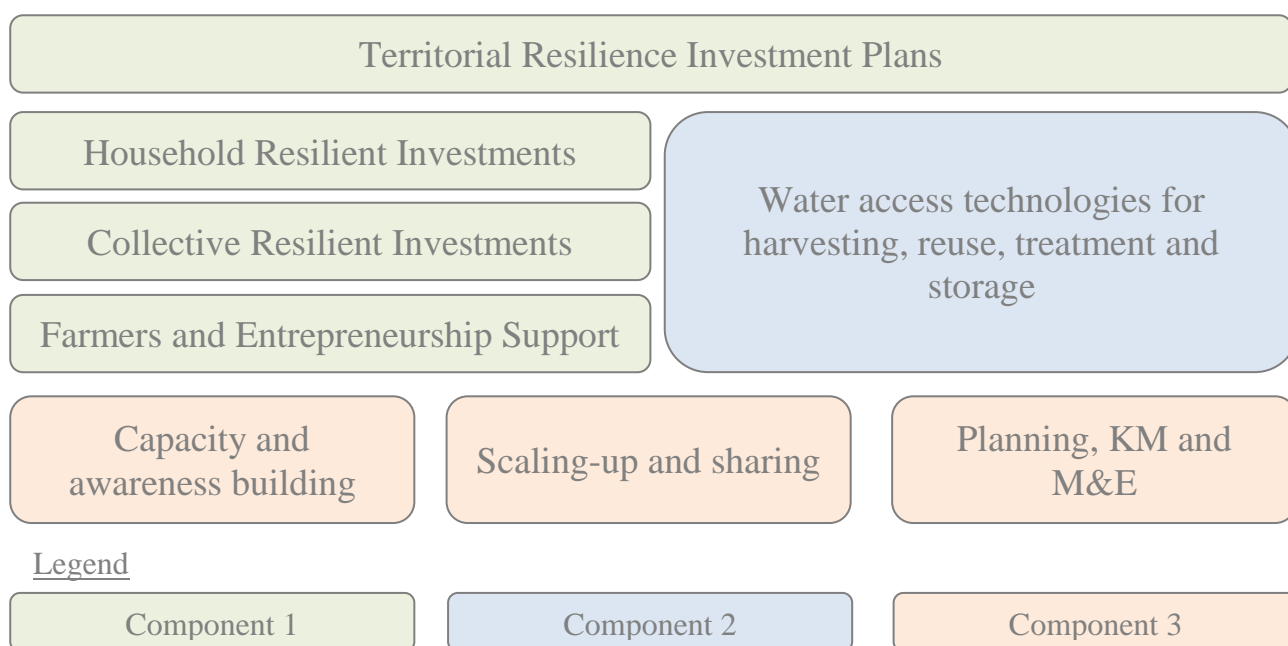


Figure 32 Project's General Structure

4.3.4 Project Intervention Strategy

The Project Planting Climate Resilience will be carried out through two main components of direct action - Component 1 - Climate Resilient Production Systems and Component 2 - Water Access. It should be emphasized here that the achievement of the main objectives of the Program, in terms of achieving higher production capacity, guaranteeing more food security and income, will be achieved through the joint action of capacity building and productive investment initiatives, materialized in the two components mentioned above. Complementary cross-cutting activities in Social Communication, Knowledge Management, and Public Policy Dialogue - which make up Component 3 - will complement the Project's drive.

The Project's gender approach, which will seek to ensure greater opportunities for women, should ensure that women are served in all three lines or scopes. The strengthening of rural youth, in the same way as the traditional, indigenous and quilombola communities will be other transversal themes and should be prioritized and present in all the actions of the Project. More elements about the Project's work with these audiences will be presented shortly after.

- *General implementation strategy*

The concrete implementation of the Project in the field will start with an awareness-raising action of the potential beneficiary public, as well as of the other social actors involved with the themes of sustainability, resilience, rural development and overcoming poverty, in order to inform them about Program's objectives and modalities of intervention. As their performance should provide a strong articulation with local and territorial spaces of participation, these should be important permanent channels for the dissemination of information and procedures related to the Program. In particular, the Municipal Councils for Sustainable Rural Development (MCSRSD) and other Municipal Committees, as well as Territorial Colleges appear as appropriate spaces to favor Program participation in local development processes.

In practice, the approach to families will be developed through community work. This approach requires performing three sequential and interconnected tasks:

- Select the communities and associations with which the Program will work;
- Mobilize selected families and elaborate, in a participatory manner, the Territorial Resilience Investment Plans (TRIPs) to be implemented with the communities and families - which will involve: investments for the implantation of water collection and storage infrastructure and CRPS and other activities necessary to implement the Program proposals in communities and with families;

iii) Implement these Plans and monitor their operation.

The importance of Territorial Resilience Investment Plans (TRIPs) in the overall implementation strategy should be highlighted here. These Plans constitute the central planning tool for all activities proposed in Components 1 and 2. They include investments, resources, training, technical advice and other initiatives to achieve the intended goals.¹⁹⁴ Each TRIP will cover an average of four territorially contiguous communities. Beneficiaries will receive non-repayable funds but will contribute at least 10% of the total value of IP, in cash or in kind.

The first task should be carried out by the State Project teams, in interaction with relevant social actors, with emphasis on local and territorial spaces for debate and planning of sustainable rural development actions. The other tasks will be the responsibility of the Technical Advisory teams to be hired (for more details on the Technical Advisory provided for in the Project, see APPENDIX II).

In addition to this work in rural communities, the Project activities will provide a number of opportunities that should strengthen the institutional capacity of various types of public and private entities, both at the state and territorial level, to implement more resilient productive systems more generally stimulating sustainable rural development.

Finally, the Planting Climate Resilience Project was not designed to work in isolation. As a result, the action strategy will, whenever possible, seek to establish partnerships to strengthen the complementarity with other state and federal projects, programs and public policies. At the same time, it will also seek to develop partnerships with the private sector (for capacity building, providing technical advice, access to markets, etc.) whenever possible.

- *Detailed methodological roadmap*

The choice of the communities for the implementation of Components 1 and 2, which will be guided by the criteria for selection of the Program's public, will be made by the State Project teams (PMUs) in consultation with the collegiate bodies that deal with the theme of rural development and poverty alleviation in the Program's municipalities and territories as described in the section above.

Once beneficiaries are selected, the first step of this roadmap will be to raise awareness and mobilize beneficiaries, with a special effort to engage in dialogue with women and youth. This will involve holding community meetings to detail the Program's work proposal and encourage the broadest possible participation in the roadmap activities. This phase will be of great importance in the 'selection' of beneficiaries, as no one can be required to participate in the Program. In the case of indigenous communities, the Program shall also follow specific procedures defined by IFAD as per the SECAP - Annex 6 of the Funding Proposal.

The next step will be dedicated to making a *participatory diagnosis (baseline)*¹⁹⁵, which will focus on the core themes of the Project and determine the best entry strategy, given the characteristics and needs of each beneficiary family. This baseline study will make it possible to identify problems, potentialities and priorities, thus delineating the best opportunities to be explored in the following steps. In the case of indigenous and traditional communities, the Project will seek its Free and Prior Informed Consent (FPIC) before any action is taken in indigenous areas or that may directly affect indigenous communities (the explanation of the consultation process leading to the FPIC provided in the Indigenous Peoples Planning Framework in Annex 6 mentioned). The plan developed with indigenous communities will ensure that investments are tailored to the specificities of the indigenous group concerned and culturally appropriate to traditional forms of social and productive organization.

The third part of the roadmap is devoted to the preparation, together with the beneficiaries themselves, of a *Territorial Resilience Investment Plan (TRIP)* which, according to the specific needs of each case, will include

¹⁹⁴ TA teams will design TRIPs with full involvement of beneficiaries, based on the Manual for Designing Productive Investment and Business Plans (a methodological tool developed by IFAD with the support of the knowledge management SEMEAR International Program). Once completed, the TRIPs will be submitted for approval by the Project, following procedures that are defined in the Project Implementation Manual (PIM).

¹⁹⁵ It could be a diagnosis along the lines of what is a Rapid Participatory Diagnosis (RPD) that is already used in Brazil and many other countries (VERDEJO, M. E. Diagnóstico rural participativo: guia prático DRP. Brasília: MDA / Secretaria de Agricultura Familiar, 2007).

definition of material investments, organize exchanges, training and other initiatives that are required to deploy Climate Resilient Production Systems (CRPS) and the water infrastructure in Component 2 (Access to Production Water) that complement investments under Component 1 (CRPS).

We will mention here that TRIPs should be tailored to the specificities of each group/community as well as to each entry strategy. Program actions will build on lessons learned from the six current IFAD projects in the Northeast. TRIPs will be developed with the full involvement of beneficiaries, based on the Manual for the Preparation of Productive Business Plans and Business Plans, a methodology developed by IFAD, supported by the SEMEAR Program.

The TRIP should include the registration in the Rural Environmental Registry (CAR) for each beneficiary, identifying the Legal Reserve (RL) as well as the Permanent Protection Areas (APPs). RL and PPAs will be a priority for implementation of CRSP to optimize the resilience of ecosystem services under conditions of climate change (being critical areas for water protection and aquifer recharge). CAR / CEFIR allows monitoring compliance with the Forest Code by directing incentives or disincentives to rural properties and planning forest conservation across the landscape. The design of the TRIPs will also consider existing credit lines, for example through the Banco do Nordeste do Brasil (BNB) or Banco do Brasil (BB), and will seek to strengthen the access of the beneficiary population to these credits, avoiding substitution of these forms of financing.

Once the TRIP is finalized, the fourth step of the roadmap is its submission for review and approval of the Project. Each state may create a body (Council or Committee) that will evaluate the Plans prepared and presented to the Project to ensure their quality in the various pertinent dimensions (alignment with Project objectives, feasibility, feasibility, etc.). This body may request additional information or recommend improvements, approve, or even reject an inappropriate proposal.

As these TRIPs will necessarily be managed by the association that brings together the beneficiary families (except schools), the fifth methodological moment refers to the execution of specific activities to strengthen the community organization. Although the association's leaders should be involved in the previous and subsequent methodological moments, it is understood that particular actions are needed to improve the functioning of these organizations from gender and generational approaches. In particular, it is time to implement practices that promote their capacity building in management, including the entire process of TRIP implementation, including accountability.

With the approval of the TRIP, the next step (sixth), is the monitoring of the implementation of the TRIP with the beneficiary communities, schools, groups and families. This monitoring should actively contribute to the satisfactory implementation of investments. TA's working method should focus as much as possible on horizontal processes of information circulation and knowledge generation, creating conditions for a 'farmer-to-farmer' rural extension, involving larger family farmers in these networks.

The seventh moment of the roadmap is supporting beneficiaries in the marketing their products. CRPS is expected to allow for an increase in self-consumption production and sales. Different market alternatives in place will be discussed with families and communities. This should lead to specific marketing initiatives, such as providing guidance and support for their access to institutional purchasing programs (PAA and PNAE), local fairs and other existing trade channels, including the possibility of selling to buyers of the private sector such as restaurants, diners, etc.

In order to socialize the work and results obtained with 'internal' (families and technical teams involved in the Program) and 'external' (the local population in general, as well as public managers, and other social actors) audiences, the methodological roadmap foresees a stage dedicated to communication (Component 3). This work is based on the systematization of experiences of beneficiary families/communities. From these systematizations, communication materials are produced so that more detailed information on water management and CRPS can be socialized. Communication and knowledge management happens throughout the project and it is fundamental to strengthen youth and women leadership in these actions.

Finally, in the last methodological step, evaluation activities (and, where appropriate, replanning) of the work performed should be organized. A Climate Resilience Index will be applied to measure changes in resilience of the beneficiaries.

The work to be carried out by the Project will be carried out by the Technical Advisory teams (see APPENDIX II), with the supervision of the state teams (PMUs) and the coordination of the Central PMU.

- *Specific elements for an approach that ensures gender mainstreaming*

The approach adopted in the Project to work on gender issues has two aspects, namely:

(i) One strand of the selected approach should primarily focus on particular actions and operational mechanisms that address the specific needs of women as subjects engaged in the productive and reproductive spheres of social life. The project will always seek the valorization of women and the respect of their rights so that the obstacles they face in daily life are overcome to enable their full participation in technical and political spaces.

In practice, this can take many forms. For example, training processes should be flexible enough to address women's specific operational needs and consider the importance of socializing housework and care. This may require events to be held at appropriate times and locations and may require the organization of extra activities for children.

In order to guarantee women's economic autonomy, it will be essential to strengthen their self-organization and to privilege the formation of 'women's groups' through a series of educational activities, such as exchanges, workshops and territorial meetings. The pedagogical approach adopted should be inspired by a 'feminist pedagogy' and will have as its main objective to foster a broad process of Environmental Education focusing on contextualized education.

It will also be necessary to prioritize the construction of spaces and activities that are often on the fringes of projects and programs, such as backyards, precisely because they are not conceived as 'productive' or 'economically profitable'. Therefore, in setting up Territorial Resilience Investment Plans (TRIP), TA teams should pay close attention to the importance of spaces that promote sustainable production modes, such as 'productive backyards'.

Another aspect that should be highly valued in interventions with women, at the family and community levels, is the incorporation of technologies, the processes of adding value and the acquisition of management knowledge and skills.

Finally, within the processes developing women's social organization, it will be necessary to take into account the need to ensure their access to the set of public policies that enable the recognition and expansion of their productive activities.

(ii) Another extremely valuable aspect concerns the implementation of initiatives that can ensure gender mainstreaming in the structures and instances of the Project itself.

Thus, several activities (training, exchange, etc.) should be carried out for allowing the technical team(s) to incorporate this theme and perspective of "social inequalities" (of gender, but also of race and ethnicity) in their 'understanding of reality' and interventions.

- *Elements for a rural youth approach*

The Project's option for an approach to sustainable modes of production, based on an agroecological bias, opens up a wide range of possibilities that favor the engagement of rural youth. Thus, qualification courses that address multiple activities and diversified production systems will be offered to young people in the communities within the Project's coverage area, so that they participate in the activities linked to the Resilience Innovation Investment Plan (RIIP). Also, it is expected that young people will gradually become involved in

community organizations (Associations) through the planned actions, assuming full membership and leadership positions.

Another strategy that will be valued in this Project involves the use of media resources to encourage young people's interest in the full range of agricultural and non-agricultural activities offered in the countryside.

- *Approaches for working with 'traditional communities'.*

The Project will also work with various types of 'traditional communities', such as quilombola and '*fundo de pasto*' communities. It may also come to work with some indigenous communities. As traditional communities (quilombolas and indigenous) are more vulnerable to situations of extreme poverty and manifest greater fragility in their organizational processes, this project will prioritize reinforcing the productive inclusion and local development of such communities. Actions in support of production and economic autonomy must be in line with the guidelines of Decree No. 6040, which establishes the National Policy for Sustainable Development of Traditional Peoples and Communities.¹⁹⁶

The particularities of the methodological approach to technical assistance for traditional communities should be incorporated into the content and methodology of the technical capacity building meetings that will take place throughout the Project, with a strong emphasis on ways of relating to the environment and the renewal of sustainable environmental practices. The production of materials that guide the implementation process of TRIPs in the context of traditional communities should be a priority of the Project's Social Communication and Knowledge Management team, so that technicians have subsidies to support their more technical interventions, mainly in the productive and environmental spheres.

4.3.5 COMPONENT I – Climate Resilient Productive Systems (CPRS)

This component's main objectives are to implement CRPS, empower beneficiaries to sustainably manage these systems and to promote women and youth leadership. Investment strategies will be designed to meet the diverse demands of family farmers given various land area sizes, climate-resilience adaptation requirements, demands of target beneficiaries and productive objectives.

Output 1. Territorial Resilience Investment Plans (TRIPs)

Through output 1, the project will select its implementation area and develop Territorial Resilience Investment Plans (TRIPs) which will act as a "master plan" to guide collective and individual investments in all three components.

Activity 1.1. Select project areas and develop TRIPs

The following tasks and selection criteria will apply (see Annex 21 for details):

Task 1.1.1. Develop a baseline study to select project area

Step 1. Selection of states. Eligible semiarid north-eastern states will present projects to the Executing Entity (EE) – BNDES – including information on governance arrangements, targets, and compliance with applicable legislation. The selection process will be based on client qualification, verification of borrowing capacity and implementation arrangements, as well as project analysis with predefined criteria (presented in Annex 21). Approximately three NEB states will be selected; preference will be awarded to states with prior IFAD projects.

Step 2. Define project area in each selected state. The municipalities within states will be ranked through an analysis based on the following criteria: (i) rural poverty incidence; (ii) climate vulnerability index and historical exposure to drought; (iii) food and nutritional security index; and (iv) water quality / availability. Technical Assistance (TA) will be selected per area, with one extensionist serving an average of four

¹⁹⁶ In Decree No. 6,040 of February 7, 2007, which establishes the National Policy for Sustainable Development of Traditional Peoples and Communities, traditional peoples and communities, including indigenous peoples, quilombolas, fishermen, extractivists, riverine populations, among others, are "culturally differentiated groups that recognize themselves as such, which have their own forms of social organization, occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral and economic reproduction and use knowledge, innovations and practices generated and transmitted by tradition." (CONSEA. **Terra: direitos patrimoniais e territoriais. Documento elaborado pelas CP 5 e CP 6 do CONSEA para plenária de 29 de outubro de 2008.** Brasília: CONSEA. 2008. Available at: <http://www4.planalto.gov.br/consea/eventos/plenarias/documentos/2008/direitos-patrimoniais-e-territoriais-sobre-a-terra-10>).

communities (total of about 140 families) over a three-year period for Component 1 activities and two-year period for Component 2 activities.

Step 3. Select beneficiary groups. Each state will define the beneficiary groups, focusing on those with the greatest climatic, socioeconomic and environmental vulnerability. A baseline survey will be conducted to collect information on agricultural production, herds, local climate, water availability, gender issues, nutrition, among others of the target population. Priority will be awarded to marginalized groups, youth, and women. Participation is not mandatory, so public awareness campaigns (see output 6) and stakeholder engagement (Annex 7) are necessary. For indigenous communities, the project will also follow Indigenous People's Planning Framework (IPPF) plan as presented in Annex 6.

Task 1.1.2. Develop TRIPs. TRIPs are the planning tool for all activities proposed under Components 1 and 2. They include investments, resources, capacity building, and other initiatives to achieve the objectives. Each TRIP will cover an average of four territorially contiguous communities. The beneficiaries will receive non-reimbursable funds, but shall contribute with at least 10% of the total TRIP value, in kind or in cash. Technical assistance (TA) teams will design TRIPs with full involvement of beneficiaries based on the Manual for Designing Productive Investment and Business Plans. Once completed, the TRIPs will be submitted to the project for approval.

Output 2 – Household Resilient Investments

Through output 2, CRPS will be implemented in Family farms and in backyard gardens. Investments will receive TA for development, implementation, and initial monitoring.

Activity 2.1. Implement CRPS in family farms

Objective: Reduce vulnerability of production to droughts and increase income, developing a progressive culture of multiple sustainable uses of productive areas with the implementation of Climate Resilient Productive Systems (CRPSs).

Selection criteria: Target beneficiary families (section 4.3.2) that already have water for production.

Investments: Resources to implement the CRPS.¹⁹⁷

Area: 31,000 plots with an average of 1/2 hectare each (total 15,500 hectares)

All productive investments of this axis, which will be included in the participatory prepared TRIPs (see the previous section) will have the following characteristics:

- Supported production activities will follow the six principles and practices of CRPS (see section 4.2.3 and APPENDIX I). This will not only increase resilience but also contribute to increased production and efficiency as well as reduce carbon emissions.
- Funds will be non-refundable.
- Investment resources will be disbursed to groups that are formally organized and constituted as regular legal entities (community associations), and may subsequently be distributed to individual members following approved TRIPs.
- TRIPs should directly involve 50% women and 50% youth.

All funded productive investment will receive Technical Assistance for three years for the development, implementation and monitoring.

Activity 2.2. Implement backyard gardens using CRPS

Objective: Develop irrigated, diverse and productive backyards in conjunction with activities in Component 2, using CRPS principles to reduce families' food insecurity from droughts and value and strengthen the role of women in production.

Selection criteria: Target audience families (section 4.3.2) that don't have water for production. These same beneficiaries that will receive water access investments in Component 2.

¹⁹⁷ Such as seeds, seedlings, organic fertilizers, equipment rental or purchase, irrigation systems, tools, fences, etc. as mentioned before, these material investments will have Technical Assistance provided by the Project.

Investments: Resources to implement CRPS.¹⁹⁸

Area: 36,000 gardens with an average size of 1/5 hectare each (total of 7,500 hectares).

All productive investments of this axis, which will be included in the participatory prepared TRIPs (see the previous section) and will be managed by community associations, will have the following characteristics:

- Supported production activities will follow the six principles and practices of resilient climate agriculture in the Semi-arid. This will not only increase resilience but also contribute to increased production and efficiency.
- Funds will be non-refundable. However, beneficiaries must contribute with at least 10% to the funding amount of TRIPs.
- Investment resources will be disbursed to groups that are formally organized and constituted as regular legal entities (community associations), and may subsequently be distributed to individual members in accordance with approved TRIPs.
- TRIPs should directly involve 50% women and 50% youth as protagonists of planned actions.
- All financed productive investment will receive Technical Assistance for two years for the development, implementation and initial monitoring of TRIPs operation.

Output 3 – Collective Resilient Investments

The funds for collective investments are also non-reimbursable and will follow the same co-funding and TA as individual investment in output 2.

Activity 3.1. Implement Collective Areas Sustainable Management (CASM)

In several communities of the semi-arid region, there are areas of collective possession and use of the *Caatinga*.¹⁹⁹ With the increasing population and land use in the Semi-arid these communities are degrading and depleting the *Caatinga* by timber extraction for firewood and overgrazing.

Beneficiary communities will be chosen according to the targeting methodology described by the methodological roadmap presented above. The content of the TRIPs will have its specificities, because these communities have the challenge of managing its *Caatinga* common areas.

Objective: The main objective is to improve the ecosystem services provided by the *Caatinga*, such as microclimatic regulation, carbon sequestration and fixation, pest and disease control, water provision, waste decomposition, natural pollination of crops and other plants, and provision of raw materials (such as timber, oilseeds and fruits). The system will stabilize and, if possible, increase the forage supply. The enhanced ecosystem services help ensure that the community is the main stakeholder in the conservation and recovery of the ecosystem services.

New options for income generation are needed, especially for women and youth, and the increase of forage for the herd, so that the animals gain more weight and compensate for possible loss of income due to the herd's reduction. It is possible to develop a slow and progressive culture of multiple and sustainable uses of the *Caatinga* and reduce extensive grazing, while increasing income, encouraging family succession, together with the conservation and recovery of the ecosystem services.

Specific Objectives:

- Recover degraded areas using CRPS
- Decrease timber demand by implementing eco-efficient stoves and biodigestors;
- Increase supply and efficient use of water for production;
- Structure community seedbanks and nurseries to increase genetic diversity and potential products;
- Promote low-impact productive activities in collective areas (e.g. beekeeping).

¹⁹⁸ Such as seeds, seedlings, organic fertilizers, equipment rental or purchase, irrigation systems, tools, fences, etc. as mentioned before, these material investments will have Technical Assistance provided by the Project.

¹⁹⁹ Pasture Fund traditional communities always fall into this category. There are also settlements that have collective *Caatinga* areas (which may go beyond the Legal Reserve and APP areas).

The common practice in communities in the NEB semiarid is extensive pasture where animals have unrestricted access to all areas throughout the year. Thus, sustainable management and land reclamation require profound cultural change, which will need to translate into changes in management practices. Courses, workshops, practices, seminars, exchanges and community volunteering combined with traditional knowledge of these populations and the technical expertise will be implemented to achieve the Project's objectives.

As in the previous cases, TA team should carry out the necessary activities for elaborating a Territorial Resilience Investment Plans (TRIP) that is appropriate to the reality of the community, which will have sustainable management of collective areas of *Caatinga* as the main theme. Thus, the promotion of exchange visits will be important as an element of awareness and a concrete reference for the construction of the TRIP. These initiatives will promote dialogue with communities that are already working with new modalities of CRPS. Training events should also be held, as well as several TRIP workshops.

Selection criteria: communities that have a common use area of around 500 hectares or more.

Investments: Tools and materials for implementing CRPS, nurseries, seedbanks, eco-efficient stoves and biodigesters.

Area: 60 CASM with an average size of 600 ha each (total of 36,000 hectares).

TRIP should also provide for the material investments that will be required to implement sustainable management of these collective *Caatinga* areas. Investment possibilities include:

- Seedlings and seeds. Wherever possible, due to distances and transportation costs, seedling production and seed purchase for these initiatives can be undertaken by nurseries in schools (see the following section).
- Nurseries: Where there are already sufficiently large seedling nurseries that are close to the target areas for revegetation, planting material can be purchased ready for use; otherwise seed will be used to increase the stock of community nurseries to be established with Program support or, in some cases, for direct sowing.
- Seed banks: or through the local collection, in which case local people will be paid to collect the seed, under the supervision of Program technicians, to ensure the quality of the source trees.
- Fences to ensure herd management and pasture rotation.
- Equipment and Tools.
- Eco-efficient stoves (see section 4.2.3 - Eco-efficient stoves). After installing these stoves, communities will be advised to use this equipment. It is not sufficient to deliver the stove, but necessary to teach people how to use it and with what type of fuel.
- Biodigesters (see section 4.2.3 - item Biodigesters).
- Equipment and tools for the development of beekeeping and meliponiculture activities. Beekeeping, both of native species and *Apis* (Africanized), is an activity that does not require a high initial investment and is accessible to many family farmers. It is based on the rich diversity of native plants of the *Caatinga* biome and is therefore considered a sustainable and agroecological activity. This is, of course, entirely consistent with the idea of resilient production systems, as beekeeping allows harvesting 'product' from the *Caatinga* while conserving it. The Project will be able to finance beehives, honey extraction tools, clothing suitable for working with bees, etc. The necessary training will also be carried out.
- Extractivism from *Caatinga* fruits (e.g. umbú, caatinga passion fruit, licuri oil, etc.).
- Other investments needed to ensure the smooth running of this activity.

Activity 3.2 - Implement CRPS in Schools

Rural schools are where young people, children of farming families, acquire knowledge on various subjects, including rural life and agricultural production systems. The Project will seek to enable these educational institutions to work on CRPS, rational use of water for production, renewable energies, and other climate resilient practices.

In the visits made to different rural schools during the program design mission, it was evident that few institutions work with CRPS, having no place to exercise, teach and learn about the theme. That is why the Program has instituted a subcomponent of investments for rural schools.

Public Schools (municipal or state) and Agricultural Family Schools (EFAs), located in priority municipalities or within a certain distance of the selected communities, will be identified and invited to submit proposals, with the support of technical assistance teams. To be chosen, these schools must:

- Have a permanent supply of water in a sufficient amount to meet agroecological practices needs;
- Have a compatible area for the implementation of climate resilient agricultural practices.

The format of the proposals will be defined in the Project Implementation Manual (PIM). This format should be simple and appropriate to learning and beneficiaries' empowerment. The School Investment Plan should have the participation of school managers and teachers in its development and execution processes. The Project will also implement activities with the cooks who prepare school meals to orient them to the use native fruits and vegetables in their recipes, most of which will come from climate resilient production systems. Such action will enhance food and nutritional security of the children attending such schools, and make cooks (most of them women) aware of the importance of adapting their recipes and changing their eating habits.

Objective: Enable rural educational institutions for youth to experiment and teach CRPS, rational use of water for production, renewable energies, and other resilience practices to students. Target the cooks who prepare school meals, encouraging them to use native fruits and vegetables, reinforcing children's food and nutritional security.

Selection criteria: rural schools within a range of the target areas (section 4.3.2). Preference will be awarded to Family Agriculture Schools (EFAs).

The following activities will be eligible for investments in schools:

- CRPS teaching and experimentation;
- Development and maintenance of nurseries and seedbanks;
- Promotion of entrepreneurship in CRPS; and
- Training cooks and students on the nutritional value of native fruits and vegetables to diversify and enrich diets

Area: 1,000 schools (100 families per school), with 1/10 hectare each (total of 100 ha and 100,000 families).

Investments: Resources to implement CRPSs, such as seeds, seedlings, organic fertilizers, equipment rental or purchase, irrigation systems, tools, fences, nurseries, training materials, computers, etc.

Activity 3.3 - Test productive models of Bio saline agriculture

As stated above (see section 4.2.3 - Technical Analysis of the Project's Proposed Alternatives), in the Semiarid, brackish or salty groundwater is common. This happens most often in regions where the substrate is crystalline (which, as seen in section 2.4.2, represents approximately 80% of the semiarid area). The result of this is that around 25% percentage of the wells dug in the Semiarid have brackish or saltwater, unfit for human consumption. It is common in several regions of the Semiarid, more than 40% of the wells have very salty water (> 1,500 mg/l TDS - Total Dissolved Salts). We have also seen that the desalination process produces a 'concentrate' or 'tailings', and the increase in 'tailings' salinity, when compared with that of the source well water, can vary from 20 to 41%.

In this context, the Project will finance the implementation of biosaline pilot production units from the 'concentrate' produced by 24 Freshwater Project desalination plants that have been installed and are operating.

The objective of the activities supported by the Project will be to set up small production units, which should include small areas to be irrigated with the concentrate. In general, the available concentrate only allows for the irrigation of small and collective use areas. In contrast, the availability of water enables intensive production. The productive areas installed by the Project will be oriented to animal consumption and to the production of forage or vegetative material of forage species that have a tolerance to salinity (forage, palm, gliricidia, leucena, sugar cane, forage watermelon). The crop production obtained from biosaline irrigation should enable an increase in the forage potential of the beneficiary families' properties. The salinization of the cultivated soil will be avoided through the use of appropriate practices and technologies: this topic will be specifically monitored by the Fresh Water Project team and EMBRAPA.

For further details on this Biosaline production, see section 4.2.3 - Technical analysis of the alternatives to be worked on by the Project - Biosaline production.

Objective: Develop pilot testing testing of productive activities (agriculture, animal breeding) using effluent from the desalination process, which is currently is not used and accumulate in evaporation tanks.

Selection criteria: communities benefitted from collective desalinization systems

Undertakings: Fish breeding and irrigation of halophyte plants in small areas²⁰⁰.

Investment: Fish, tanks, irrigation equipment, resources to implement the CRPS²⁰¹, soil laboratory tests, etc.

Number of biosaline production systems: 24 biosaline systems, each irrigating 1 hectare and benefiting 50 families (total 1,200 families and 24 hectares).

Output 4 – Farmers and Entrepreneurship Support

To facilitate the replication of CRPS, support will be provided: i) TA teams will build a territory-based intervention strategy identifying properties demonstrating exemplary experiences of CRPS and water access technologies and building a network to exchange these good practices; and ii) Small grants and business management support to microenterprises that innovate and produce specific tools and equipment to facilitate the implementation of CRPS.

Improving crop performance, animal breeding efficiency, dealing with a problem, or harnessing a potential, frequently requires new ideas, information and knowledge. Exchange visits can meet information needs and enhance knowledge sharing.

This involves organizing a group of farmers to visit another farmer or group (community, settlement, association, etc.). Thus, in this type of event, the main source of ideas and information for the group needed is their peers. In exchange visits, it is essential to emphasize the notion that peers are an excellent source of information. At the same time, although usually the visit is done to a ‘more advanced’ group or family regarding, in general, the visitors also discuss and comment on what is being observed. In this sense, the event is a real ‘exchange’ and not a one-way process. The exchange visit among farmers can often be more effective than courses or lectures given by technicians on the same topic due to the language similarity and experience of real-life situations. For instance, if a settlement is having sanitary problems in milk production, in general, it is more interesting to organize a visit to a group of farmers who have overcome the problem, instead of calling a researcher to talk about the theme.

Activity 4.1 - Build a Farmers Network

Farmers who already implement at least one aspect of CRPS will be invited to participate in the project as farmer-trainers. These farmer-trainers should be selected on their farming expertise as well as skills and interest in sharing information. Their selection will not be limited by the criteria of the target group or the size of the property. They can have several roles in the project; from integrating the technical advisory teams, allowing visits to their farms as demonstration plots, or participating in local farmer networks, training and workshops. The Project must be proactive in ensuring that women, as well as men, become farmer-trainers. The farmer-centered extension systems that empower farmers as change agents to improve livelihoods in their communities will be described in detail in Component I.

A good starting point is to discuss with local authorities and farmers to find out about their interest in testing the approach. The next step is to select farmer-trainers. Frequently, extension services and communities (i.e. producer organizations or local authorities) select farmer-trainers together. A common procedure is for extension services to agree on criteria with community representatives, and then the representatives use the criteria to choose the farmer extensionists. Criteria vary but often include having a good reputation, interest and skill in sharing information, climate resilient farming skills, and being a full-time resident in the community

To facilitate the replication of CRPS, TA teams will build a territory-based intervention strategy of CRPS network building. To do this, they will identify farms/properties that have developed attractive/ advanced experiences of CRPS and water access technologies. Frequently, these more advanced cases refer to the farmer-trainers mentioned above. These cases will be essential assets for disseminating information and for bolstering knowledge management on the subject. The following tools will be used:

²⁰⁰ Hoffman and Shannon, 1985.

²⁰¹ Such as seeds, seedlings, organic fertilizers, etc.

Task 4.1.1 Train Farmers

TA teams will need to be trained in CRPS principles and practices, water access technologies and gender-sensitive approaches (see Annex 8), appropriate for indigenous and traditional communities (Annex 6) and that attract youth.

In addition, farmers who already implement aspects of CRPS will be invited to be farmer-trainers. Their selection will not be limited by the criteria of target group or property size. They can have several roles in the project; from integrating TA teams, allowing visits to their farms as demonstration plots, or participating in local farmer network, trainings and workshops. The Project will ensure both women and men become farmer-trainers.

Task 4.1.2 Hold exchange visits

Exchange visits are an important source of practical information and knowledge sharing. They involve organizing a group of farmers to visit another farmer or group (community, settlement, association, etc.). Thus, in this type of event, the main source of ideas and information for the group needed is their peers. In exchange visits, it is essential to emphasize the notion that peers are an excellent source of information. Although usually the visit is done to a 'more advanced' group, it is not a one-way process, because visitors discuss and comment what is being observed. These initiatives are often more effective than courses or lectures on the same topics due to language similarity and experience of real-life situations. For instance, if a settlement is having sanitary problems in milk production, in general, it is more interesting to organize a visit to a group of farmers who have overcome the problem, instead of calling a researcher to talk about the theme.

Although exchange events are communication spaces among peers, this does not mean that the TA present needs to stay silent. Sometimes, a question about a subject that has not been well explained can be fundamental.

Farmers from 5000 medium-sized farms (at least 5 hectares) located in the project's region will be invited to participate in the exchange visits. There will be an active participation of Young Communicators who will have an active role participating in these exchanges (see activity 6.1).

Messaging apps are widely used in Brazil and can be applied to bridge communication gaps in farming communities. TA can create and manage online social-media groups to share experiences on specific topics and solve problems promptly. These groups can further the sharing of the knowledge learned in the exchange visits.

Activity 4.2 Promote local entrepreneurship for products and services that support family farming

Most small-scale products and tools available to farmers are directed towards traditional large-scale monoculture, creating a vicious cycle that makes farmers turn to non-resilient production practices. Specialized small-scale equipment and mechanization can make farmers more productive and able to add value to their production.

The few scattered farmers who dare challenge the model must develop or adapt their own tools. During visits to Bahia and Pernambuco, the design team witnessed several examples of these innovations: forage palm chopper and feeder, long-arm pruning shears, wood chipper, and low-tech water reuse facility, among others. This thriving creativity and potential demand face high barriers to their widespread use. Microentrepreneurs in this sector are mostly small and lack the management capacity for commercial financing, making efforts to scale up or even start their businesses nearly impossible. Their innovations usually never go beyond their plot.

With greater access to capital – especially capital with management assistance and sustainability conditions tied to it – microentrepreneurs with businesses that have a direct impact on climate resilient agricultural production can scale up their operations and influence family farmers beyond the project's direct beneficiaries to improve their practices. A dynamic business environment can also attract youth.

The project will support investment in small-scale mechanization of microenterprises²⁰² that provide services or products for improving family farmers' CRPS thereby enhancing rural entrepreneurship. Small grants may support microenterprises that innovate and produce specific tools and equipment, nurseries, composting services, apps to manage production, organic fertilizers, pest control, and market platform, etc. These enterprises will also receive business management support. The GCF grant will cover the incremental costs associated with higher-than-average screening, evaluation and technical assistance costs of the fund's investments. Additional funds could possibly be raised as co-financing from financial institutions to amplify the number of beneficiaries.

This initiative would be the first institutional effort to invest in product and service providers, specifically for climate-resilient small-scale agriculture practiced by the beneficiaries of the project. The success of the project will have an important demonstration effect with respect to the feasibility of such projects to other regions of the NEB semiarid.

Expected results of **Component 1** include:

- 575 TRIPs designed and approved;
- 31,000 families benefiting from Family Farms Investments and TA;
- 36,000 families benefiting from backyard gardens investments and TA;
- 1,000 schools teaching CRPS;
- 1,800 families from 60 communities benefiting from CASM;
- 540 eco-efficient stoves installed;
- 540 biodigesters built;
- 540 income-generating and resilient production-based activities in collective areas;
- 1,200 families benefiting from 24 biosaline productive systems;
- 5,000 medium-sized (at least 5-hectare) productive units participating in farmers networks;
- 550 TA and farmer trainers trained;
- 24,000 farmers participate in exchange events / workshops;
- 84,124 hectares under sustainable management;
- 11 MtCO_{2e} emissions reduced; and
- 70 micro enterprises supported to supply small-scale equipment for CRPS.

4.3.6 COMPONENT II –Water Access

Compared to other semiarid regions of the world, where it rains between 80 to 250 mm per year, the Brazilian semiarid is the wettest on the planet. In the latter, the average rainfall is between 300 and 800 mm. annual. Rainfall concentrated in a few months of the year and distributed unevenly throughout the semiarid.

As is natural in the semiarid regions, this rainfall is lower than the evaporation rate, which in the Brazilian semiarid region can reach up to 3,000 mm per year. This causes a challenging water deficit for those living on agriculture and livestock in the region. This challenge has been addressed by farming families by storing rainwater in diverse social technologies. Accumulated water is for human consumption as well as for agriculture and livestock use.

The purpose of this component is to disseminate practices of efficient water capture, harvesting, storing and use to decrease vulnerability of livestock and crops to rainfall irregularity and prolonged droughts. All investments in this component will be channeled through TRIPs (see sections 4.3.3 and 4.3.4) for beneficiary groups (to be defined as per section 4.3.2). Component 2 beneficiaries are the same families that will implement the backyard garden (described in activity 2.2 of component 1) but do not have water for production. Using the extra stored water for irrigating small plots of land will enable the diversification of production, mainly with fruits and vegetables, for family consumption and to sell surpluses.

The resource allocated to this component will fund widely proven use of social technologies and water access and treatment practices, complementing and reinforcing Component I Climate Change Resilient Productive Systems (CRPS). articulates around the following four axes:

- Rainwater harvesting and storage;
- Groundwater storage;

²⁰² According to Brazilian Law, microenterprise is defined as a company with an annual gross revenue lower than R\$ 360.000,00.

- Reuse of domestic waters (gray and dark);

We identified a set of technologies, which are already widely known (called Social Technologies - STs), which already have MDS Operating Instructions (OIs). In addition to detailing the construction and use characteristics, the existence of IOs explains that public and private technical advisory entities already have a good knowledge of the implementation and enhancement of these infrastructures. This is a critical factor in the planning of the Project execution that should allow a quick implementation. However, the Project will also work on proposals that are not yet 'standardized' through normative instructions, such as green septic tanks.

Investments made in order to guarantee access to water will encourage the maintenance of small irrigated areas, in which vegetables, fruits or fodder can be cultivated. It will also allow irrigation of nursery for seedlings production (family or collective) to increase the productive potential of beneficiary families, strengthening their adaptive capacity to climate change. Irrigated areas can be more intensively used and have the following comparative advantages in relation to productive systems conducted without water supply (predominant in the Brazilian semiarid):

- They are enclosed areas to avoid the presence of free-range animals during part of the year.
- They are small areas (with less than half a hectare) when compared to the total surface of properties.
- They receive a larger and more regular amount of fertilizers (compounds, manures), and irrigation allows a relevant valuing of this fertilization (risk reduction)..
- Irrigated areas mainly destined for forage production with perennial or multi-cycle species²⁰³ can reach high productivity of green matter per hectare per year, guaranteeing fresh food to the herd and decreasing the pressure on native vegetation particularly during the dry season.
- The intensification of production allowed by the use of water promotes an increase in the diversity of created and cultivated species.
- Access to water allows farmers to produce in a regular manner throughout the year providing revenue and green/fresh food (not only for the family but also for the herd). This is a significant differentiation particularly during the dry season when other productive activities are limited.
- The production intensification in these areas tends to mobilize familiar labor force, women and youth, in particular, throughout the year. This kind of infrastructure is generally built close to housing.
- Part of the production of these areas is for family feeding, bringing diversification and improvements in daily nutrition (that often includes cultivating medicinal plants) and increases in food and nutritional security. This aspect is strengthened by the production, which will be carried out following Agroecology principles.
- Cultivated areas, even if limited, generally allow part of the production to be commercialized directly, usually in the neighborhood and in local food markets, contributing to income generation and diversification.

They also favor the introduction of new practices and are, thus, learning spaces.

The TA provided to beneficiaries will address issues of efficient water management, good irrigation practices, and techniques for limiting evapotranspiration, and precautions to avoid soil salinization. All pumping systems will use renewable energy (photovoltaic or wind). The installation and good use of these technologies will require a training program. The techniques used in all these cases include principles and practices laid out in CRPS (see ANNEX I), such as wind-breaks, soil cover (dry or green), the association of complementary crops, etc.

All water infrastructure methodologies selected in the PCR are widely disseminated in NEB and are extremely simple to build, known in Brazil as “social technologies”. Construction of the water infrastructure technologies listed below is usually carried out by trained community masons, beneficiary families, and their neighbors with oversight from TA teams. In addition to creating an activity for local workers, it also ensures future maintenance of the cisterns without relying on outside services. Technical training and training in water management will be systematically provided in association with the construction process.

Output 5 – Water access technologies for harvesting, reuse, treatment and storage

²⁰³ Such as forage cactuses (*palma forrageira*), gliricidia, sugar cane and sorghum.

TRIPs should include water access technologies. Before starting the activities it will be necessary to hold a set of training events. The first of these is for the training of masons who will make the construction/implementation of water infrastructure. Training events should also be held for beneficiary families on water infrastructure management and water management for production. Exchange visits will also be encouraged to meet other families who are already working on agroecological production from water catchment and storage.

The construction will be organized by the TA teams and carried out by local artisans (masons, etc.) and families.

Activity 5.1 - Build boardwalk cisterns²⁰⁴

Objective: To provide access to water for the production of food, seedling and/or animal water consumption. **Investment:** Materials for the construction of cisterns; irrigation equipment; tools and materials for implementing CRPS. Construction of a plate tank with a storage capacity of 52 m³, coupled with a 200 m² concrete water-catchment area (the boardwalk or *calçada*). **Application:** Irrigation of small plots (such as backyard gardens, school vegetable gardens, etc.) to support short cycled crops (mainly vegetables) during the dry season. The role of women in this production is fundamental. Impacts on family food security and nutrition are significant.

Total: 20,000 cisterns.

Task 5.2.1 Build small farm ponds²⁰⁵

Farm ponds are excavated reservoirs with narrow, deep vertical walls. They allow the storage of at least 500 m³ of water and should be between 3 and 5 meters deep, to reduce evaporation and keep the accumulated water longer. It collects surface run-off water, often with the help of conduits or ditches. Requires compacted soils to decrease infiltration. To reduce evaporation and seepage losses, when the distance allows it, water from the barrier can be pumped to a production tank. In the construction process, a backhoe should be used to reach the beginning of the rock layer.

Objective: To provide access to water for food production and animal water nutrition.

Investment: Small-width deeply excavated reservoirs that store at least 500 m³ of rainwater to reduce evaporation and retain water for longer periods.

Application: Requires clay soils to avoid infiltration. It usually is capable of storing a large quantity of water that, if well managed, can last several months without replenishment. It has the potential to irrigate a larger system (up to 1 ha.), making the cultivation of some short-cycle crops possible. This can be managed so as to help install a CRPS (see Component 1).

Total: 500 farm ponds.

Task 5.2.2 Construct small groundwater storage basins²⁰⁶

The program will finance the construction of underground dams. This Social Technology (ST) is a cross-sectional blocking system for riverbanks, streams and temporary streams, accomplished by attaching a flexible plastic blanket to an excavated ditch until it meets the crystalline or waterproof thickening, which is a rocky layer characteristic of a large part of the Brazilian semiarid soils. Its function is to retain rainwater that seeps over into the soil intervals, providing the formation or elevation of the water table. Upstream and near the dam should be built a waterfall well, lined with concrete rings, bricks, stones or plates, to better use the water stored in the underground dam.

Investment: Construction of small underground dams through a transversal blocking system along

²⁰⁴ This refers to large cement-plate cisterns, with a concrete catchment area, that is known in Brazil as 'cisterna calçada' (or 'boardwalk cistern' in a very literal translation). See Law number 12.873, dated October 24, 2013. Decree number 8.038 of July 4, 2013 9606, of December 10th, 2018 and Operational Instruction SESAN no. 11, of September 6th, 2017.

²⁰⁵ Instruction regulated by Law 12,873 of 24 October 2013, Decree number 8,038, of 4 July 2013 and Ordinance number 130, of 14 November 2013.

²⁰⁶ This kind of water storage infrastructure is known as a 'barragem subterrânea' (underground dam, in a literal translation).

temporary streams and river banks, with flexible plastic sheeting lining a trench (from the surface to rock or impermeable layer).

Application: Capable of irrigating larger areas and storing a significant quantity of water for several months.

Area: 500 small underground dams.

Activity 5.3 - Implement treatment and reuse systems for household wastewater

For rural families, untreated water represents risks to the environment, soil, and human health. Only 27% of the NEB population (mostly in urban areas) has access to sewage collection and treatment.²⁰⁷ The treatment systems selected use simple and affordable technology based on cycling water and nutrients for food production. These technologies adapt forms of rural sanitation to the household level and contribute significantly to the sanitary improvement of environmental and living conditions of beneficiary families.

Task 5.3.1 Implement systems for greywater reuse

Investment: Construction of a treatment system which consists of filtering greywater residues through physical and biological mechanisms, in which organic matter is biodegraded by microorganisms and earthworms.

Application: Irrigate small plots, such as backyard gardens and nurseries. It avoids pollution Area: 10,000 greywater treatment systems irrigating 1/5-hectare plots (2000 hectares total).

Task 5.3.2 Implement green septic tanks

Investment: Construction of evapotranspiration tank (or green septic tank). Anaerobic digestion, which occurs in septic bed, consumes organic matter from household waste in the root zone of the plants.

Application: Can irrigate trees (usually banana trees, which are part of the treatment systems) and non-edible plants.

Area: 5,000 blackwater treatment systems irrigating 0.05-hectare plots (250 hectares total).

Expected results of **Component 2 include:**

- 20,000 cisterns with walkway;
- 500 trench barriers;
- 500 small underground dams;
- 10,000 greywater reuse systems;
- 5,000 blackwater treatment systems.

4.3.7 COMPONENT III – Knowledge Management and Scaling-up

Component 3 supports and expands on the activities in Components 1 and 2. The outputs described below will be explored in the project so that information flows serve both to consolidate learning among families who will experience new approaches in CRPS and water access as well as to scale to a regional and international level the adaptation and mitigation measures that the project will propel. Cross-cutting activities supporting Components 1 and 2 that require central coordination are described below.

Output 6 – Capacity and awareness building

This output combines several strategies: (a) highlight the leading role of youth and women as 'knowledge managers and generators and 'local talents'; (b) consolidate laboratories for learning, exchange and replication of sustainable practices within communities through diverse written and audiovisual mechanisms; (c) facilitate dynamic M&E of socio-environmental impacts, which will be registered in materials that allow effective influence in spaces dedicated to public policymaking.

²⁰⁷ Instituto Trata Brasil, see: <http://www.tratabrasil.org.br/saneamento/principais-estatisticas/no-brasil/esgoto>

Activity 6.1 - Develop a young communicators network

A total of 450 young people will be selected to participate in a media resource empowerment program, focusing on successful experiences in accessing water resources and CRPS. Besides being responsible for registering activities and facilitating the production of audiovisual and written materials, Young Communicators (YCs) will act as “social mobilizers”, fulfilling a crucial role in social organization processes.

Another important initiative in which YCs will take part, together with the farmers’ network (see activity 4.1), is the construction of a participatory monitoring model with audiovisual resources.

Local and regional exchanges between young communicators will be promoted. YC will work closely with TA teams and community-based partner organizations. Each will receive a scholarship through a "learning grant" and have access to equipment (mobile phones and notebooks).

Activity 6.2 - Strengthen capacity for women, youth and traditional communities

All educational activities (workshops, courses and exchanges) will follow a “learning by doing” approach that explores experimentation of alternative technologies and information exchange among community members. Given that women, youth and traditional communities tend to be on the margin of community-based organizing efforts, the Project will prioritize capacity-building opportunities directed especially towards these groups.

(a) **Rural women:** The Project strengthens capacities of rural women as part of an encompassing Environmental Education program, which explores the connections between feminism, women’s rights, the Semiarid region biomes, agroecology and food and nutritional security.

(b) **Youth:** In addition to YC networks, youth will be involved in short-term professional courses, with a focus on the diversity of production systems and CRPS. Then they will be incorporated into TA teams and serve as liaisons with families.

(c) **Traditional communities:** Implementation of sensitivity training for TA professionals on issues of race and ethnicity, with focus on methodological approaches and instruments that consider the relationship these communities have with natural resources and their land management techniques. The second line of action involves conducting case studies of traditional communities.

Output 7 – Scaling-up and sharing

Activity 7.1 - Promote South-south Cooperation (SSC)

Another aspect of this Project involves developing capacities by sharing knowledge, skills, resources and technologies among countries through the construction of a more horizontal relationship of solidarity than the classic "North-South" cooperation. These Project activities will be coordinated by the Central Project Management Unit (CPMU). At the start of implementation, possible exchange sites inside and outside Brazil and the systematization methods to be prioritized will be identified. In addition to TA team members, farmers will be invited to participate. The Project will invest in the construction of a database cataloguing the practices and technologies for proper management of natural resources that have been identified in these different contexts.

Activity 7.2 - Facilitate discussions to unlock policy barriers

Several policies that are constraining family farmer’s CRPS were identified during project design. The most notable include:

- a) lack of an Environmental Reserve Quota (CRA in Portuguese) market, and
- b) norms and regulations preventing family farmers from accessing markets.

As recommended by the World Bank,²⁰⁸ establishing the CRA market could provide additional incentives for family farmers to increase the area covered with the Climate Resilient Agriculture Systems laid out in the project. A CRA credit produced on a beneficiary's property could be used to offset a legal reserve (RL) debt on another property within the same biome, preferably, the same state. The RL debts represent obligations acquired by any given farmer that can be efficiently offset by environmental improvements produced by smallholder farmers with CRPS, thereby generating a transfer payment from the RL offender to the smallholders. Implementing a State CRA could create a market for forested lands, adding monetary value to a preserved *Caatinga*. Given the high costs of *Caatinga* restoration/reforestation, the exchange of CRAs could become an effective way to facilitate Forest Code compliance, meeting NDC targets and avoiding deforestation of surplus native vegetation.

Concerning norms and regulations for marketing family farming agricultural produce, the Committee on World Food Security and FAO (2016) recommend governments employ public policy to support family farmers in issues such as pricing policies, public procurement, food safety and standards, and appropriate credit and infrastructure. Family farmers in Brazil are affected by the top-down imposition of food safety standards designed to respond to large-scale, mechanized and standardized commodity-based food production for large distribution channels. As a consequence of these entry barriers, family farmers revert to informal markets with lower demand and prices.

The project will facilitate discussions in fora geared towards marketing and market access for family agriculture. The proposal is to take advantage of existing organizational structures, reinforce them and create new ones when necessary. These working groups should involve a broad set of stakeholders (e.g., project beneficiaries, NGOs, the private and public sectors) and develop a roadmap to implement the CRA markets and improve the regulatory conditions for family farmers' access to markets. In addition, it will commission research on targeted policy and regulatory issues.

To qualify inputs produced in these forums, aimed at influencing public policymaking, materials (publications and videos) will be produced that present results of the actions undertaken, in accordance with the progress indicators used in the M&E system. These publications, that present concrete social, environmental and economic outcomes of transitioning to a model of family farmer CRPS, can influence public opinion, thereby contributing to the 'scaling up' process.

Activity 7.3 - Experiment with CRPS and resilience participatory monitoring model

Since the transition to CRPS is gradual and its social, economic and environmental impacts are not immediately perceived, there is a need to build a monitoring methodology that demonstrates and gives visibility to transformations promoted during implementation.

Therefore, the proposal is to develop a specific monitoring methodology, guided by some indicators, that can be used to monitor CRPSs in each territory, so that a picture may be drawn that clearly captures the changes in the flows of inputs and resources, in addition to the effects on the environment and social relations in these time frames. The Central Management Unit (UCGP) will coordinate this action at the regional level, being responsible for conducting workshops to train Young Communicators and other members of the TA teams in methods of participatory systematization and monitoring that are suitable for CRPS. Audiovisual media instruments, such as video and photographs, will be of great value in recording the evolution of CRPS, by allowing clear visualization of the socio-environmental transformations that will occur during the intervention period.

Systematizations will be published and subsidize political advocacy processes, reaching external stakeholders, such as public managers and institutions working on related topics.

Output 8 - Planning, Knowledge Management and M&E

An independent closing evaluation and mid-term review should be included in the project. Section E7 and Annex 11.

²⁰⁸ WORLD-BANK. *Brazil's INDC Restoration and Reforestation Target*. Washington, DC: World Bank 2017.

At National level, undertakings include: building-up an information platform based on systematizations and innovation experiences, 12 GIS evaluations (4 at start-up, 4 at midterm and 4 at completion), contracting yearly M&E, IT and Communications services, preparing the Project Completion Report, carrying out M&E meetings and planning workshops (one per year) and elaborating 4 Studies, Systematizations and other Knowledge Management products (2 at mid-term and 2 at completion).

At State level, undertakings include: 12 Studies, systematizations, and other Knowledge Management products (4 per State), 21 planning workshops, 21 M&E meetings and 21 Territorial Committee Meetings (1 per year per State). It also involves elaborating the baseline study, mid-term review and impact evaluation including the PRO-WEAI Study. Finally, the M&E system at the State level includes 3 more State-specific studies.

Expected results of **Component 3:**

- 54 workshops for young social communicators;
- 100 systematizing workshops;
- 9 state exchanges;
- 36 regional exchanges;
- 414 youth benefited with scholarships and communication equipment;
- 70 newsletters and informative reports produced;
- 300 training workshops for women about sustainable technologies;
- 360 territorial meeting for women;
- 12 exchange programs for women;
- 27 training workshops of gender experts;
- 243 training workshops for youth;
- 4 national learning routes;
- 3 international learning routes - LAC and Africa;
- 8 thematic studies;

5. ECONOMICAL AND FINANCIAL ANALYSIS AND SUSTAINABILITY

5.1 Introduction to EFA analysis

The current chapter summarizes the main assumptions, hypothesis and results of the Project's economic and financial analysis (EFA). The profitability indicators were calculated taking into account the outcomes, phasing and expected beneficiaries for each type of activity. Benefits were calculated for a 20-year period lifetime cycle as the project involves agroforestry and natural resource management activities with both short and long term results, requiring an extended period of analysis.

The economic and financial analysis consists of comparing the resources required for the project's implementation (represented by the project costs) with the expected impacts calculated as the benefits of each promoted activity. It is conducted from the point of view of each beneficiary (financial analysis), but also aggregating and calculating the benefits for the Brazilian economy.

The financial analysis allows understanding, based on behavioral hypothesis and parameters, if potential beneficiaries will be motivated to take risks and make the investments required by the Project. It implies the simulation of the incentives and benefits at the individual level (or even in groups), but also to make sure that the beneficiaries will have the means to take on the project's proposal, with a realistic approach by making assumptions on the delays in adopting technologies and on drop-out rates for entrepreneurship initiatives.

The economic analysis considers all the costs and benefits of the Project. It allows evaluating the global efficiency in resource management for the government and society as a whole. The analysis is based on the aggregation of the results derived from farm models using economic prices and adding externalities (that will be represented, in this case, by the environmental benefits from avoiding CO₂ emissions).

Both in the financial and economic analysis, each initiative will be considered profitable if the additional benefits of the project's cash flows (over a 20 year period) surpass investment and recurrent costs at a cut-off rate. As a result, profitability indicators will be the Net Present Value (NPV, economic and financial), the Internal Rate of Return (IRR, economic and financial) and the Benefit-Costs ratio (B/C, both economic and financial). A sensitivity analysis will test the vulnerability and robustness of the obtained results for changes in key economic variables.

The first part of the chapter summarizes the sources of the project's benefits (both measurable and not measurable) as well as the main assumptions and hypotheses made. Thereafter, the financial analysis is presented, which analyzes the proposed models and the corresponding expected benefits. In the end, aggregated benefits (with externalities included) will determine the overall economic profitability and the sensibility of the results in the face of adverse shocks and climatic events.

Estimates and calculations were made using information obtained in field visits, and consultations with experts. Other references were also used, including current agroforestry experiences records and M&E tables. Nevertheless, as far as the proposed activities are not still disseminated among beneficiaries, the models still represent a theoretical construction, that will need to be demonstrated in the field.

5.2 Market analysis

Market options can be found at the community level, local fairs or markets and intermediaries or at the regional or international level for niche products or commodities. Most of the increase in production will be consumed locally, and the presence of imported and non-regional food signals that the local markets have the capacity to absorb increased production. In this context, technical advisory services will provide support in orienting the production towards demand, linking farmers to buyers, local processing units (fruit, milk, honey, meat) and other markets by developing local and regional networks and facilitating the farmers' participation in trade fairs, as well as in federal or subnational level programs supporting purchases from family farmers (like PAA and PNAE).

Eggs, milk, fruits and vegetables, forage and meat (goat and beef), and diverse types of tree products are the proposed products to be marketed. The extent of the additional production for the market has been estimated in the production models in the economic and financial analysis, versus the business as usual scenario. In general, these models indicate that the proposed production systems are viable. The Project will be implemented under a demand-driven approach.

Nine models are proposed in this chapter, based on the most frequent products, simulating the Project's proposal and impacts at the individual level. However, the aggregation in production estimates may not provide an accurate source of information to compare with an implicit demand for those products. Besides, a differentiation process can be found with higher prices in the market for eggs, chicken, honey and vegetables from family farming, because they have qualities recognized and valued by consumers both at the local and regional levels. Competitors are processed products from the agribusiness production, that can be cheaper but are not preferred if local production is available (for health and flavor reasons mostly).

The following sections present the market potential for family farming in the Northeast, in selected value-chains.

5.2.1 Goats and sheeps

The Northeast accounts for more than 90% and 56% of the total national herd of the goat and sheep, respectively. The two activities are typical in the Northeastern Semiarid, with predominantly extensive breeding systems for meat production. The main destination of the meat is local consumption. Family farming predominates in the number of goat farms (228 thousand, or 91.6% of the total) and in the number of products sold (1 million heads, or 77.1% of the total). Even though non-family enterprises are a small minority in quantity in the region (8.4%), their revenues from goats and sheep reach 22.9% of total sales. It is important to point out that, when considering the semiarid region as a whole, goats and sheep are, by far, the main production of family farms of the region.

5.2.2 Poultry farming – egg production

Egg production in Brazil reached 44.2 billion units and exports in the same period were 5,834 thousand tons²⁰⁹. Even if production is mainly destined for the local market (which currently has the highest per capita consumption in history), new international markets (such as South Africa) have opened up in the last years, which may generate new production challenges. According to the IBGE Egg Production Survey for 2017 and the *Banco do Nordeste Diário Econômico* Bulletin (May 2017)²¹⁰, the Northeast accounted for 14.3% of egg production in the country in 2016, with 442.44 million dozens. In the region, "(...) the states of Pernambuco and Ceará, concentrate approximately 65% of the regional production, with 152.40 million and 134.90 million dozen eggs in 2016, respectively." According to Guanzirolí et al.²¹¹, based on IBGE (2006), family farmers in the region recorded a gross value of poultry and egg production (29.7%). The highest participation of family establishments in the Gross Value of Production of birds and eggs was recorded in the States of Maranhão, Alagoas and Piauí.

5.2.3 Cassava (or manioc)

Cassava root production is made almost entirely by family farming and has experienced a 47.6% drop in the Northeast region in the last 10 years and generated the need to purchase cassava and its derivatives from other regions for the domestic market. However, the area has market potential since it is the destination of 12.9% of manioc starch production of other regions. In addition, there are small factories that are the family enterprises, considered as a possible up-grade in the value chain of cooperatives or associations of family farmers who seek to add value. Both family enterprises and large industrial plants can diversify production (with flour, scrap, biscuit, etc.)

²⁰⁹ ABPA. **Relatório Anual 2017**. São Paulo: ABPA. Available at: http://abpa-br.com.br/storage/files/3678c_final_abpa_relatorio_anual_2016_portugues_web_reduzido.pdf 2017.

²¹⁰ Available at: https://www.bnb.gov.br/documents/1342439/1603204/196_18_05_2017.pdf/578f9de7-a572-04d2-3777-372cc5d4fb00.

²¹¹ GUANZIROLI, C.; DI SABBATO, A.; VIDAL, M. D. F. **Agricultura Familiar no Nordeste: uma análise comparativa entre dois censos agropecuários**. Fortaleza, CE: Banco do Nordeste do Brasil, 2011. 172 p.

In the last ten years, Brazil was the second-largest producer of cassava starch with a production of more than 360 thousand tons a year, on average, and in 2017, 261 thousand tons of starch were processed in the country due to the low root supply²¹². However, it has small participation in the world transactions with annual imports that still surpass the exports.

5.2.4 Honey

Although Brazil is among the top ten exporters of honey in the world, it is also one of the lowest consumers (0,09kg per capita²¹³), and more than 60% of total production was destined for export in 2016. The Northeast, which produces 26% of the country's honey, mostly by family farmers. Northeastern honey is considered of superior quality due to the region's low humidity (which inhibits diseases in bees) and its lower use of pesticides when compared to other regions. In the Northeast, the states with the best results are Bahia and Piauí. In the northeast, beekeeping is an eminently family farming activity and often serves as an additional source of income. Almost all producers, family or not, relate to cooperatives in one way or another, thus necessarily going through similar commercial channels.

5.2.5 *Opuntia forage cactus*

Brazil is the world's largest producer of forage *Opuntia and Nopalea*²¹⁴ cactuses. It is a strategic food resource for the arid and semiarid regions of the Brazilian Northeast since it is a crop that presents a unique physiological aspect, supporting long periods of drought. It is estimated that there are around 500 thousand hectares of forage cactuses in the Northeast, distributed in the states of Pernambuco, Paraíba, Alagoas, Rio Grande do Norte and Bahia. More recently, these forage cactuses are also being planted in Piauí and Ceará.

In Brazil, the *Opuntia* and *Nopalea* cactuses are used almost exclusively for fodder, since species without thorns have been selected.

5.2.6 Sisal

The leaves of sisal produce a highly resistant fiber that is used to create handicrafts, brooms, bags, hats, strings, mats and rugs. It can be used as well in the production of cellulose for the production of kraft paper (high strength) and other types of thin paper (for cigarette, filter, dielectric paper, sanitary napkin, diaper, etc.). In addition to these applications, it is possible to use sisal fiber in different economic branches or sectors: the automobile sector, furniture, home appliances, geotextile (for use in protection of slopes, in agriculture and road cladding), in the polypropylene blend, as a substitute for fiberglass (in the composition of plastic objects) and civil construction²¹⁵.

The by-products of sisal, which today are practically considered waste, can have numerous uses. Mention should be made of the possibility of using mucilage as a food supplement for cattle and goats; as an organic fertilizer and juice, which is rich in ecogenin, a drug used as a medicine and can be used as a bioinsecticide for the control of caterpillars of nematodes and ticks, in the shape of soap and healing paste. The substrate resulting from the processing of sisal can also be used for the cultivation of edible mushrooms. Sisal has an important place in the exports of states such as Bahia.

The main importers of Brazilian sisal are the United States (manufactured fiber, mainly in the form of carpets), China, Mexico and Portugal, among others. There are also smaller-scale buyers such as the Netherlands, Spain, Germany, Hong Kong, France, Singapore, Chile and Belgium. The Brazilian fiber faces some problems to enter the world market because of the quality, which is much lower than the African one, which has a market value far superior. Even so, there are good prospects for the sisal sector. Despite the strong presence of

²¹² FELIPE, F. I. *Conjuntura e perspectivas para o mercado de mandioca e derivados*. São Paulo: CEPEA - Esalq/Usf, 2017. Available at: http://www.agricultura.gov.br/assuntos/camaras-setoriais-tematicas/documentos/camaras-setoriais/mandioca/2017/40a-ro/apresentacao_camara_setorial_agosto.pdf.

²¹³ FAO. *The State of Agricultural Commodity Markets 2018. Agricultural trade, climate change and food security*. Rome: FAO, 2018. Available at: <http://www.fao.org/3/I9542EN/i9542en.pdf>.

²¹⁴ SANTOS, D. C.; FARIAS, I.; LIRA, M. A.; SANTOS, M. V. F.; ARRUDA, G. P.; COELHO, R. S. B.; DIAS, F. M.; MELO, J. N. *Manejo e utilização da palma forrageira (Opuntia e Nopalea) em Pernambuco*. Recife: IPA, 2006. 48p. (IPA. Documentos, 30).

²¹⁵ ALVES, M. O.; SANTIAGO G. E.; MOREIRA LIMA, A. R. *Diagnóstico Socioeconômico do Setor Sisaleiro do Nordeste Brasileiro*. Fortaleza. Serie Documentos do ETENE. Banco do Nordeste, 2015.

synthetic fibers in the market, the requirement for natural fibers is still present. The sisal fiber can be exported as prepared sisal, cables, ropes and twine, yarn and rugs.

The new applications related to uses in the automotive industry. Another possibility of using sisal fiber is in the furniture and construction industry. The main competitors are the other plant fibers, so there is a challenge for the Sisal Sector to improve quality and reduce inefficiencies among the value chain.

5.2.7 Market constraints

Once the increase in production occurs, access to the market could be a challenge for small producers. Some identified problems in the selected value chains are:

- (a) weak bargaining power and higher transaction costs due to the problems in supply capacity, scale and timeliness,
- (b) inefficiencies due to inadequate technologies for processing,
- (c) low access to marketing services and packaging,
- (d) higher post-harvest losses due to improper transportation and storage facilities.
- (e) higher exposure to climate change

Those issues weaken family farmers' capacity to comply with minimum standards and requirements to reach value-added or niche markets.

For the fruit and forage tree products, there are additional problems concerning the development of the value chain itself. There is a lack of information on proper technologies, prices, buyers and standards. However, it means that there is still room for family farming to participate in shaping those channels obtaining a better bargaining power and position in the value chain. This could elevate the level of risk involved, but the gains could be higher as well.

To counter these risks, the Project, through TA, will strengthen farmer groups to market their products jointly and link them with existing storage and processing units, such as cooperatives and other private sector companies. The TA provided will also support farmers in identifying demand and possible additional outlets.

5.3 Financial analysis

5.3.1 Parameters and assumptions

The financial analysis considers the costs and benefits for adopting the project's proposal from the individual perspective over the period of 20 years (including the program duration of 8 years).

Models.

Nine models were developed to simulate impacts for each type of intervention on each targeted group of beneficiaries. For Component I, eight models are proposed. Benefits and savings from Biodigesters and Efficient Stoves are considered separately. For these models, benefits are based on promoting Agroforestry practices and technologies in order to increase resilience and productivity for each forage production ecosystem, improving income generation and reducing the environmental pressure. All measurable benefits arise from addressing several problems such as: (i) decrease in incomes as a result of increased costs of forage purchases when a climate change event occurs; (ii) decreased productivity due to the high pressure on native grazing; (iii) expansion of degraded lands and unsustainable practices in collective areas.

For Component II, there are three models to illustrate the range of activities that could be developed by the targeted beneficiaries. In this case, both quantitative and qualitative benefits are expected from the Project's intervention relying on two axes: (a) Increased access to water for production by implementing tested social technologies; (b) the transition in agricultural practices to a new productive and resilient model with impact on food security and climate change mitigation.

Direct outcomes are expected to come from an increase in the land area that will be recovered under the new approach, as well as increased productivity, sales and incomes for the family farms involved.

Qualitative benefits rely on (i) social-capital enhancement and improved cohesion to increase empowerment of targeted groups, (ii) improvements in food security, nutrition and health by increasing self-consumption of more in-farm natural fruits and vegetables.

As mentioned before, the analysis made in this chapter stem from farm models, that will be presented in sections to follow. Yet, even if the models used in this EFA assume the existence and importance of certain types of activities and try to recognize some possible effects and impacts, the Project acts over an uncertain and diverse reality of family farmers, so none of these main activities in the models should be considered mandatory in order to apply for proposals during implementation. On the contrary, the identified support ‘mix’ of investments that were included in the models could guide a possible list or menu of flexible Agroforestry packages for each type of environment, context and family that is benefited (given the categorization that was used in this exercise).

Models, sectors and products for the ‘*with* and *without* project’ situations have been selected by applying the following criteria for the Northeast Semiarid: representativeness (for the ‘*without* project’ situation) and climate change adaptation impacts, scaling-up potential and pro-poor, pro-more-gender-equality and pro-youth propensity for the proposal (for the ‘*with* project’ situation).

Aggregation.

All of the models are supposed to be progressively involved in the project’s proposal from year 1 to 8. That’s why 100% of benefits will be considered after year 8. However, the 75% success rate is applied while aggregating in order to illustrate the case better when beneficiaries get lower impacts or dismiss the project’s proposal during the first 4 years.

Resilience.

In forage production models there is a simulation of a climate change event that shocks the productivity every 5 years (60% of losses), low down the breakeven (5%), and has increased impacts without climate change adaptation measures. In the ‘*with Project*’ simulation, adaptation measures would allow cushioning the blow (15%), recover the breakeven and turn over the increase in impacts. All the assumptions are very realistic in order to avoid overestimation of the project’s benefits.

Time span.

The financial analysis prepared for the Planting Climate Resilience Project considers the costs and benefits for adopting the project’s proposal from the individual perspective over the period of 20 years (including the program duration of 8 years).

Prices.

Prices in Brazil are determined by the market. References have been taken from local producers, suppliers and retailers, verified with the official and private open information platforms for selected products.

Interest and financial discount rates.

The average local Interest rate for domestic credit in the past 5 years is shown in the table below. The financial discount rate is considered at 10%.

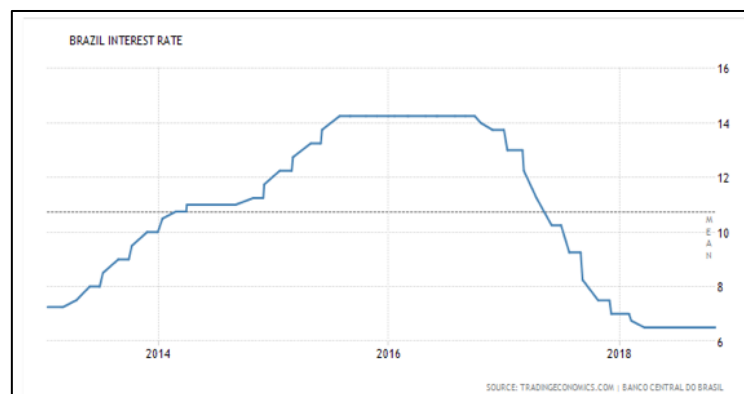


Figure 33 Average local interest rate (%) 2013-18.

5.3.2 Project's proposed models

Component I

The eight proposed models for this Component intend to simulate the impact of Agroforestry Investment Plans, Natural Resource Management Investment Plans (with Income Generating Activities) and Micro-enterprises to develop agroforestry input suppliers (adapted machinery, nurseries, for example). In the first case, it considers promoting agroforestry activities in degraded or monoculture lands to reduce both the degradation of grasslands and purchases of externally-produced forage when a climate event occurs. For the Natural Resource Management Investment Plans, bee-keeping is considered as a proposed income-generating activity to reduce over-exploitation of natural resources, and eco-efficient stoves and biodigesters are income saving innovations

The adoption of Agroforestry practices and technologies is considered an opportunity for farmers to address climate change challenges. All the models proposed are designed to try to increase resilience. The table below illustrates each model's in-farm dynamic when adopting Agroforestry technologies and practices

Table 5 Component I models

Model	Main features	Purpose	Main activity	Typical innovative system	Targeted families
2a	Agroforestry on rain-fed land	Production of forage & fruit	Goat and sheep breeding - Meat	0.5 ha. for forage production with agroforestry. Herd size: 80 animals	10,300
2b	Agroforestry in rain-fed land	Production of forage & fruit	Poultry	0.5 ha. for forage production with agroforestry, for 200 laying hens	10,300
3a	Agroforestry diversification of <i>Opuntia</i> monoculture plots	Production of forage & fruit	Goat and sheep breeding – Meat	0,5 ha for Forage production and agroforestry. Herd size: 80 animals	10,300
3 b(*)	Agroforestry diversification of <i>Opuntia</i> monoculture plots	Production of forage & fruit	Dairy cattle – milk	0,5 ha for agroforestry diversification for 20 dairy cows	5,000
4	Microentrepreneur business development	Develop production of agroforestry inputs (tools, seedlings, etc.)			70
5	Reduce pressure on collective/protected areas	Sustainable management of	Bee-keeping	The typical group of farming families with access to protected or collective areas	540
6a		management of	Eco-stoves		540
6b		<i>Caatinga</i> areas	Biodigesters		540

(*) All models will have access to investments (with Territorial Resilience Investment Plans - TRIPs) and TA, except for model 3b, that will participate in the Project via Farmer Networks.

Component II

In this case, the proposed models are based on the need for water access in communities as an entry point, to promote the paradigm shift under the agroforestry approach. After providing training and capacity building for the implementation of water infrastructures, the component will provide support for an agroforestry investment plan with the first round of funding. This is meant to be an element to enhance motivation that will be complemented with hand-holding in the initial phases of the newly installed garden, by means of 2-year close technical assistance services under learning by doing approach. All participants should be able to benefit from a minimum agroforestry package. Three models of this type of support are simulated: i) a typical farmer of 0.5 ha with a fruit and vegetables 0.3750 ha.-plot irrigated with one of the possible types of micro-dams, ii) an average farmer of 0.5 ha with a fruit and vegetables 0.3750 ha.-plot irrigated with a cistern, and iii) a model for the development of a fruit and vegetables 0.1250 ha.-plot, to be irrigated with water from a gray water (or sewage) reuse infrastructure.

It should be considered that some of the models require only a part-time occupation (from 2 to 6 months, depending on the activity). It means that the annual income per year represents only a small part of total family incomes (and sometimes even personal incomes). Also, drop-out rates are challenging to estimate, but an intensive hand-holding, a rigorous selection and the family approach demonstrate that there is a possibility to keep up all the well-sustained investment plan initiatives.

Table 6 Component II models

Model	Main features	Purpose	Main activity	Typical innovative system	Targeted families
1a,b	Irrigated agroforestry backyard gardens	Vegetable beds, fruit trees	Vegetable and fruit production	0.5 ha. Garden with 0.375 ha. of irrigated area with water from micro-dams or cisterns / 21 veg. beds + trees.	21,000
1c	Small Irrigated agroforestry gardens	Vegetable beds, fruit trees	Vegetable and fruit production	0.125 ha. of irrigated area, with water from reuse infrastructures / 7 vegetable beds + fruit trees.	15,000

More details on the proposed models are presented in APPENDIX III – Production model details

5.3.3 Financial analysis of proposed models

Overall, the financial analysis shows positive Net Present Values (NPV), Financial Internal Rate of Returns going beyond the cutoff rate and Benefit-Costs ratio higher than 1. These results suggest that all models should be considered profitable, with FIRR (Financial Internal Rates of Return) ranging from 10% to 39. % depending on the supported activity. Net present values (NPV), at the 10% discount rate, vary from R\$ 2,322 to R\$ 219,941. The following tables summarize these profitability indicators for all the financial models.

Table 7 Profitability indicators per model (A) – in R\$ (Reais)

	Model 2a - Agroforestry on rain-fed land, goats and sheep	Model 2b - Agroforestry on rain-fed land, poultry	Model 3a - Agroforestry diversification of Opuntia monoculture: goats & sheep	Model 3b - Agroforestry diversification of Opuntia monoculture: dairy	Model 4 - Microentrepren eur business development	Model 5 - Reduce pressure on collective/prote cted areas. Bee- keeping	Model 1a - Irrigated agroforestry backyard gardens: micro- dams	Model 1b - Irrigated agroforestry backyard gardens: cisterns	Model 1c - Small Irrigated agroforestry gardens: water reuse infrastructure
Without Project									
Costs	5,158	5,650	4,068	138,847					
Sales	6,534	7,497	6,534	174,924					
Margins	1,376	1,847	2,466	36,077	34,452	1,080	2,171	2,171	724
With Project									
Costs	5,568	7,256	5,568	132,811	502,452	1,329	6,549	6,549	2,828
Sales	8,168	8,127	12,128	186,804	600,000	5,346	15,032	15,032	5,011
Margins	2,599	871	6,559	53,993	97,548	4,017	8,483	8,483	2,183
IRR	14%	11%	19%	25%	10%	35%	39.0%	28.7%	19.0%
NPV	7,268	2,322	11,224	40,018	39,521	219,941	33,958	27,054	5,734
B/C Ratio	1.27	1.43	1.29	1.55	1.16	2.89	2.2	2.18	1.96
Model – FIRR – NPV – B/C Ratio									

Table 8 Profitability indicators per model (B)

Model	FIRR	NPV	B/C Ratio
	%	R\$	Nº
Model 1a- Veg. Beds and Fruit trees 1- Grey Water Reuse	19.0%	5,734	1.96
Model 1b- Veg. Beds and Fruit trees 2- Other Water infrastructure	39.0%	33,958	2.21
Model 1c- Veg. Beds and Fruit trees 3- Cisterns	28.7%	27,054	2.18
Model 2a- Forage production and Agroforestry diversification in native lands 1	14.0%	7,268	1.27
Model 2b- Forage production and Agroforestry diversification in native lands 2	11.3%	2,322	1.43
Model 3a- Forage production and Agroforestry diversification in palm monoculture lands 1	18.8%	11,224	1.29
Model 3b- Forage production and Agroforestry diversification in palm monoculture lands 2	25.3%	40,018	1.55
Model 4- Micro-entrepreneur Business development	10.0%	39,521	1.16
Model 5- Bee-keeping	35.1%	219,941	2.89

The impact on income is simulated by comparing each model family revenue with several representative scenarios of a typical 2-person income house-hold. The increases in incomes are shown, per model, in the table below.

Table 9 Income impact per model – in R\$ (Reais)/ Year

	Model 1a – Irrigated agroforestry backyard gardens: micro-dams	Model 1b – Irrigated agroforestry backyard gardens: cisterns	Model 1c – Small Irrigated agroforestry gardens: water reuse infrastructure	Model 2a - Agroforestry on rain-fed land, goats and sheep	Model 2b - Agroforestry on rain-fed land, poultry	Model 3a - Agroforestry diversification of Opuntia monoculture : goats & sheep	Model 3b - Agroforestry diversification of Opuntia monoculture: dairy	Model 4 - Microentrepre- neur business development	Model 5 – Reduce pressure on collective/prote- cted areas. Bee- keeping
Without Project									
Family incomes without Project	2,171	2,171	724						
				<i>1,376</i>	<i>1,847</i>	<i>4,176</i>	<i>63,563</i>	<i>34,452</i>	<i>1,080</i>
With Project									
Family income with Project	7,618	9,213	6,358	<i>7,154</i>	<i>8,706</i>	<i>9,919</i>	<i>74,093</i>	<i>78,038</i>	<i>4,927</i>
% increase	251%	324%	779 %	<i>420%</i>	<i>371%</i>	<i>138 %</i>	<i>17 %</i>	<i>127 %</i>	<i>356%</i>

For more details, see ANNEX 3.

5.4 Economic analysis and sensitivity

Economic analysis. The economic analysis (with economic prices to calculate total economic costs) uses the aggregated economic model's benefits (by beneficiaries) over a period of 20 years and at a shadow discount rate of 10%²¹⁶.



Figure 34 Brazil Government Bond 10Yr (2013-2018)

To incorporate the results to the economic analysis, all prices have been calculated applying conversion factors for imported tradable goods, exported goods and labor. No market distortions are supposed to affect non-tradable goods.

Externalities/additional economic benefits. Two different types of additional economic benefits were included: a) the family savings due to the implementation of efficient stoves, biodigesters and other proven social technologies; and b) environmental externalities calculated using the Ex-Acte tool software to estimate the project's mitigation impact of avoiding CO₂ emissions.

Results. The overall EIRR (Economic Internal Rate of Return) is estimated at 19.77% while the NPV reaches US\$ 152 million.

Table 10 Economic results

Indicator	Results
NPV @10%	R\$ 684,020,261
NPV @10%	USD 152,000,000
EIRR (%)	19.77%
B/C Ratio	3.18

Sensitivity Analysis: A sensitivity analysis was carried out assuming different risk scenarios. These include an increase in project costs (10%, 20% and 50%), a reduction in project benefits (10%, 20% and 50%), delay in project benefits (1 and 2 years) and the occurrence of climate change extreme events (every 2, 3 and 4 years).

The project is assumed to be profitable and resilient as it supports most of the tested scenarios as an increase in costs up to 30% or a reduction in benefits of 30%. Profitability remains positive even in the case of a mixed increment in costs up to 20% and a reduction in benefits of up to 20%. In these cases, the NPV remains in the positive range. The project wouldn't be profitable in the case of a mixed cost increase of 20% and a benefit reduction of up to 30%. Besides, nine sources of benefits equally contributing to the total project's benefits have been identified. This serves to demonstrate that the project is well-diversified and not highly exposed to price or sectorial risks

²¹⁶ Taking into account 10 year bond yields for the country (between 9 and 10%).

5.5 Concessionality: justification for GCF funding request

Existing Brazilian funding. An IMF working paper estimated the total market capitalization of the invested global multi-asset market portfolio in Brazil at BRL 7.12 trillion²¹⁷. Government bonds represented the largest asset class (37.04 percent), followed by equities (26.85 percent), bank funding (13.92 percent), corporate bonds (10.58 percent), and real-estate (5.10 percent). The total market capitalization of the three other asset categories is relatively small. IMF also provided the historical composition of the Brazilian market portfolio going back to 2005. Despite its wide range of instruments, the financial market is not directly channeled to climate change finance for the targeted region in Brazil.

After consultations in the country, it has been identified that BNDES offers specific conditions for support for the environment for different target groups and different financial terms: a) Non-reimbursable funds concerning Social Fund and Amazon Fund with R\$ 200 million that targeted 20% of agroforestry systems; and b) Reimbursable Funds concerning Climatic Fund and FINEI Environment with R\$10 million for private sector enterprises. None of those funds involves the Brazilian states as executing partners or the Northeast Semiarid as the targeted area.

Climate change finance gap. The current project requires GCF funding in order to leverage the investment for Climate Change for mitigation and adaptation to the Northeast Semiarid region, almost inexistent in the present scenario. The Brazil Country Program for the GCF, prepared in March 2018, estimates a resource requirement for mitigation and adaptation objectives that are well above the current investment level with domestic or international sources of financing. An indicative amount of resource mobilization required to promote the actions provided in the NDC is estimated to a range of R\$ 890 to R\$ 950 billion, corresponding to total investments of approximately 1% of the annual GDP at face value. Nowadays, climate change finance in Brazil is mainly concentrated in the Fundo Amazonia that is one of the most significant and important world initiatives to fight deforestation. It is expected to cover at around R\$ 3 billion that is only 0.3% of the climate change financing required amounts. Other international programs are addressed to different purposes or regions.

Key barriers and Justification. The key barriers identified for investments in climate change-related projects that justify the proposed blend of GCF funding in the targeted region are the following:

- **The rising level of public indebtedness and fiscal imbalances at the national and sub-national levels.** General government gross debt rose from 56.3 percent of GDP at the end of 2014 to 69.5 percent by end-2016 and is expected to rise further and peak in 2023 at above 90 percent of GDP. At the subnational level, the fiscal situation is also hampering the sustainability: a decline in revenues mixed with an increase in spending but aggravated by the fact that the states have limited own sources of revenues and a lower capacity to access borrowing, as well as reduced transfers from the Union. While lending by other International Financial Institutions has been addressed to the States in recent years, the new project will deal directly with the Federal Government of Brazil. BNDES will guarantee consistency between the Federal Government and support for the States, expected public expenditures and anticipated level of indebtedness. Tighter conditions for public spending and limited access to borrowing require a consistent strategy for access to funding for the States.
- **Weak investment capacity and deteriorated the local credit market.** Investment decreased from 18.1% in 2015 to 15.5% of GDP in 2017 while credit issued in local currency fell by 3.6 percent in 2015 and by 9.2 percent in 2016 due to the economic recession. The rise in credit risks for the Brazilian economy was reflected in higher interest rates increasing the credit cost while the quality of the financial assets and loans decreased as a consequence of various corporate sector scandals. Brazilian net interest margins of the financial intermediation are amongst the highest in the list of 15 peer emerging market economies²¹⁸, mainly due to high operating costs, loan losses and bank concentration.

²¹⁷ TESSARI, C.; MEYER-CIRKEL, A. **Brazilian Market Portfolio**. IMF Working Paper WP/16/51. Washington: International Monetary Fund 2017.

²¹⁸ IMF. **Brazil. IMF Country Report 18/253**. Washington: IMF, 2018. Available at: <https://www.imf.org/en/Publications/CR/Issues/2018/08/03/Brazil-2018-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-46154>

- **High perceived risks for both climate change and highly vulnerable groups funding in the targeted region.** The share of resources that commercial banks and institutional investors have been allocating to project financing, either in loans or bonds, has remained very limited and mainly concentrated on refinancing projects that are already operational, thus with a lower risk profile. Regarding commercial Banks, the implementation of the Basel III regulations is expected to reduce even more their ability to invest in high-risk assets. As a consequence, Climate Change financing addressed to highly vulnerable groups in rural areas is not offered in the Northeast Semi-arid. There is a high perceived risk of this type of investment for both the public and private sectors. BNDES, with its social and financial perspective, will play a key role in promoting and supporting this instrument that is expected to mobilize other public and private investments for this purpose in the region.
- **Lack of Long-term investment drivers and high intermediation costs.** While the Brazilian basic interest rate (SELIC) is still attractive for investors, the Brazilian Treasury Bonds act as a short-term inducement for banks and pension funds investments. As a consequence, they are discouraged from investing in long-term development projects or long-term assets. The project's tenor will allow unlocking the climate change financing under a broader long-term perspective. Besides, commercial banks charge very high mark-ups, making real interest rates of commercial loans in Brazil among the highest in the world, above 20% for corporate loans, making the Brazilian financial market less liquid and more difficult to access. Expected market volatility related to economic and political uncertainties, shifts the local investments towards the shorter end of the maturity spectrum, making it difficult to find a reference for a long-run interest rate with a duration compatible with projects-based investment reference for long-run interest rates with a length compatible with projects-based investment. The Brazilian interest rate curve presents that particularity: long-term rates do not have sufficient liquidity, and short-term rates are very high.
- **High-interest rates and spread.** Under the current financial scenario of interest rates, BNDES, States, and the private sector are not willing to take loans to invest in climate change mitigation and adaptation. Besides, the targeted groups can't have access to finance with formal banks, and climate change doesn't seem to be the first priority in terms of investments for them. With the current Project and its GCF concessionality, a blended rate will be offered, making a more attractive financial instrument that will be provided to States. As a consequence, it is expected to leverage both public (at the national and sub-national level) and private investments. The GCF grant element with the loan concessionality would allow BNDES to offer a favorable particular credit line enabling the States and the family farmers to invest in climate change purposes.

Financial structure justification and profitability indicators (focused on GCF funding)

The main current funding for climate change and highly vulnerable groups is driven by BNDES through the Amazon Fund and Climatic Fund. However, as mentioned before, it is focused on the Amazonia and '*Mata Atlântica*' regions leaving the Northeast Semi-arid with no access to funding.

Without GCF financing, under the current conditions, the project would not be profitable for the country or for the States. With the Planting Resilience Project, both the States and the Union will be benefiting from concessional lending terms, which would lead to a viable investment project, taking into account also a GCF grant element.

The full concessionality of the GCF financing will allow the project to provide support for the poorest of the poor families to transition to a climate-resilient production system. Within this group, the project will be able to target women, youth and traditional communities (indigenous, quilombola and *fundo de pasto*), which are the groups that are most vulnerable to climate-related risk, endure extreme poverty conditions, lack access to the labor market, and have no permanent income sources.

GCF grant of US\$ 34 million will be focused on activities to implement CRPS (Component I) and the Knowledge Management and Scaling-up activities (Component III).²¹⁹ The project addresses a key constraint to adaptation and emission reduction in agricultural production in Semiarid Brazil: the lack of information and technical advisory services for promoting climate-resilient agriculture practices. The Project's knowledge management component will promote identification, systematization and public awareness of CRPS. Proposed exchanges will enable lessons learned sharing among farmers.

With the GCF funding, the Project unlocks the potential for replication and scaling up to other developing countries facing similar challenges, thus facilitating a paradigm shift. By fostering South-South Cooperation (SSC), the project gains in effectiveness and scale, enhancing its contributions to the implementation of the 2030 Agenda goals and for living no one behind.

GCF loan of US\$ 65 million will be the main funding providing support for CRPS Investment Plans in Component I for individual family farmers, schools and collective areas.²²⁰ It will also partially support Component II's water technologies needed to shift towards a CRPS.²²¹ The loan element is aligned with priorities for indebtedness and eligibility criteria established by the national government (COFIEX of the Ministry of Economy). GCF loan interest rate is lower compared to domestic IRs and provides grace period and tenor's benefits. Without the GCF concessional loan, the cost of funding would be significantly higher and would undermine the Project's economic viability. With GCF support, the project leaves locked-in development paths and uses an innovative approach in the designing of climate-resilient production systems. This will only be possible bringing together stakeholders and knowledge from various sectors, as well as merging IFAD, GoB through BNDES and GCF financing.

The key barriers identified to investment and the indebtedness of the recipient that justifies the current blend of GCF funding in the targeted region are:

- A rising level of public indebtedness and fiscal imbalances at the national and sub-national levels;
- Weak investment and deteriorated the local credit market;
- Lack of long-term investment drivers and high intermediation costs; and
- High-interest rates and spread practiced in Brazil.

²¹⁹ (i) Component 1: for individual family farms - US\$ 28.58 million (100% of total cost), (ii) for backyard gardens - US\$ 1.95 million (10.6% of total cost) ii) Component 3: Knowledge management - US\$ 3.97 million (39% of total component's costs).

²²⁰ Component 1 (i) individual - US\$ 13.7 million (GCF covers 75% of the total cost), (ii) Schools -US\$ 3.68 million (100% of the total cost); and (iii) Natural Resource Management in Collective Plans - US\$ 5.16 million (100% of the total cost).

²²¹ Component 2: (i) Cisterns - US\$ 28.49 million (40% of total cost); and (ii) Re-use of grey and blackwater systems (US\$ 13.97 million) (70% of total cost).

5.6 Benchmarks

Latin America is a relatively scarcely populated continent; thus, costs per beneficiary tend to be higher than other developing regions. Table 12 below compares the PCR with other GCF rural development projects in the region. Considering only GCF's finance portion, the efficiency is 99 USD/beneficiary. Even considering the entire cost, PCR lies within the higher effectiveness range of rural adaptation projects in the region.

Table 11 Project Benchmarks

<i>Items</i>	Planting Climate Resilience Brazil	PROEZA Paraguay	CFAVCP-Cambodia	FIRA-México	DBSA CFF - South Africa and SACD Region	RECLIMA-El Salvador
	Base	1	2	3	4	5
<i>Date of approval</i>		March 2018	March 2018	March 2018	November 2018	Sept. 2018
<i>Direct Beneficiaries</i>	1,000,000	87,210	390,000	802,980	22,732	225,000
<i>Annual Emissions</i>	580,455 t CO ₂ eq	262,267 tCO ₂ eq	35,000 tCO ₂ eq			210,842 tCO ₂ eq
<i>EIRR</i>	19.77%		16.13%	-	-	
<i>NPV</i>	US\$ 152 Million		US\$ 133.543	-	-	
<i>Effectiveness of GCF Adaptation Inv. (USD GCF/Beneficiary)</i>	US\$ 99.5 / beneficiary	US\$ 288 / beneficiary	US\$ 102 / beneficiary	US\$ 27 / beneficiary	US\$ 2,446 / beneficiary	US\$ 159 / beneficiary
<i>Effective-cost (cost per tCO₂ reduced for GCF funding)</i>	US\$ 9 / tCO ₂ eq	US\$ 96 / tCO ₂ eq	US\$ 19 / tCO ₂ eq	US\$ 30.82 / tCO ₂ eq	US\$ 1.87 / tCO ₂ eq	US\$ 169 / tCO ₂ eq
<i>Total Cost (US\$ Million)</i>	217,83	90.3	141.39	27	170,55	127.7
<i>GCF funding (US\$ Million)</i>	65 Million loan 34,5 Million grant	25.1 Million grant	10 Million loan 30 Million grant	22 million loan	55 Million loan 0.61 Million grant	35,8 Million grant

5.7 Macroeconomic and financial market overviews

5.7.1 Macroeconomic overview

After years of economic expansion mainly driven by expansionary policies, a shift in external conditions led to a progressive decline in economic growth followed by a severe recession in 2015-16, causing a significant slowdown in economic activity mainly due to domestic political uncertainty, fiscal disequilibria and the lack of confidence. During the following years, investments showed a decline of around 30 percent. Even if a mild recovery is currently underway²²² (supported by accommodative monetary and fiscal policies), there are still pressing challenges to recover the level of investment that would unleash the Brazilian potential.

The main current difficulties are based on: i) a structural fiscal imbalance at the national and subnational level; ii) rising public debt (General government gross debt rose from 56.3 percent of GDP at the end of 2014 to 69.5 percent by end-2016 and is expected to rise further and peak in 2023 at above 90 percent of GDP) and iii) low level of investment (it decreased from 18.1 in 2015 to 15.5 of GDP in 2017).

²²² IMF Executive Board. Article IV Consultation with Brazil (August, 2018)

At the subnational level, the fiscal situation is also hampering the sustainability: a decline in revenues mixed with an increase in spending but aggravated by the fact that the states have limited own sources of revenues and a lower capacity to access borrowing, as the transfers from the Union reduced. Lending by International Financial Institutions has been addressed to the States in recent years.

Concerning the credit markets, Real credit fell by 3.6 percent in 2015 and by 9.2 percent in 2016 due to the recession. The rise in credit risks for the Brazilian economy was reflected in higher interest rates increasing the credit cost while the quality of the financial assets and loans decreased as a consequence of various corporate sector scandals. Brazilian net interest margins of the financial intermediation are between the highest among 15 peer emerging market economies²²³, mainly due to high operating costs, loan losses and bank concentration.

In the 2017-2018 period, the fiscal deficit has declined to 1.7 percent of GDP in 2017 as a result of under-execution of spending and inflation dropped to record lows (2.9% in 2017) after a tight monetary policy. The economy grew 1% in 2017 and is expected to keep that path in the next years. The deficit in the current account was reduced between 2014 and 2017 as imports contracted, cushioning the impact of the recession, but it is expected to rebound in the mid-term as investments recover its strength.

An important cornerstone of the macroeconomic strategy was relying on the flexible exchange rate regime. It acted as a shock absorber while inflation was controlled by the Central Bank, regulations and the economic context. Also, the banking system was resilient to the crisis²²⁴ as the main banking indicators remained adequate while rollover risks were dissipated as there was a low foreign-currency exposure and a comparatively small share of foreign-held government debt. However, Brazil is still vulnerable to a tightening of global financial conditions and possible trade disruptions²²⁵, and the public debt is rising while national and subnational public expenditures are being reduced to keep up the fiscal accommodation.

5.7.2 Brazil's capital markets

Based on the information available at the end of 2015, an IMF working paper estimated the total market capitalization of the invested global multi-asset market portfolio at BRL 7.12 trillion²²⁶. Government bonds represented the largest asset class (37.04%), followed by equities (26.85%), bank funding (13.92%), corporate bonds (10.58%), and real-estate (5.10%). The total market capitalization of the three other asset categories is relatively small. IMF also provided the historical composition of the Brazilian market portfolio going back to 2005.

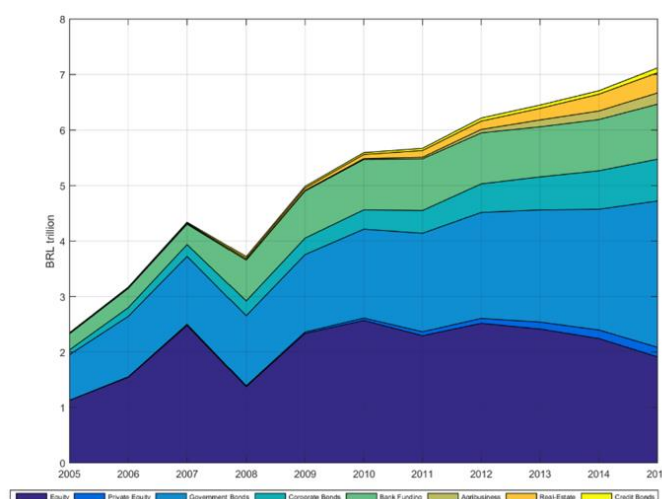


Figure 35 Estimated market values in the Brazilian market portfolio, 2005-2015

²²³ IMF. **Brazil**. IMF Country Report 18/253. Washington: IMF, 2018.

Available at: <https://www.imf.org/en/Publications/CR/Issues/2018/08/03/Brazil-2018-Article-IV-Consultation-Press-Release-Staff-Report-and-Statement-by-the-46154>.

²²⁴ As stated in the IMF's **Brazil: Financial System Stability Assessment** report in 2018. Retrieved at: <https://www.imf.org/en/Publications/CR/Issues/2018/11/30/Brazil-Financial-System-Stability-Assessment-46411>.

²²⁵ IMF, 2018, as reference in footnote above.

²²⁶ TESSARI, C.; MEYER-CIRKEL, A. **Brazilian Market Portfolio**. IMF Working Paper WP/16/51. Washington: International Monetary Fund, 2017.

Government Bonds: With a total amount of BRL 2.6 trillion in outstanding securities, the Brazilian domestic government bond market has expanded rapidly since the mid-1990s and has become one of the most liquid and sophisticated among emerging markets. The domestic federal public debt (DFPD) is composed of a wide range of securities, including floating rate, fixed-rate, inflation-linked, and dollar-indexed instruments. The Financial Treasury Bill (*LFT - Letra Financeira do Tesouro*), whose floating rate remuneration is based on the Selic rate, is the most significant government security in terms of outstanding amounts. The National Treasury Bill (*LTN – Letra do Tesouro Nacional*), zero-coupon fixed-rate security, has expanded sharply in recent years and is now the second most important type of outstanding marketable liability. The National Treasury Notes Series-F (*NTN-F - Notas do Tesouro Nacional série F*), which is a standard coupon-bearing fixed-rate security, has also expanded in recent years. The other NTN securities are indexed to various other indices. The NTN-B and NTN-C, inflation-indexed bonds, have increased their share of total marketable debt in recent years. Overall, the securities discussed in this table represent 99 percent of the total domestic commercial debt of the federal government. Debt issuance by states and municipalities is modest.

Table 12 Brazilian Government Bonds

Security	Description	Indices	Type of Interest	Interest	Terms	Maturity Rule
LFT (Letra Financeira do Tesouro)	Floating rate bills	Selic Interest Rate	Floating	None	26 months (average term)	Third month of each quarter
LTN (Letra do Tesouro Nacional)	Short-term, zero-coupon fixed rate bills		Fixed	None	6, 12, 24, and 36 months	First day of January, April, July and October
NTN-F (Notas do Tesouro Nacional série F)	Long-term fixed rate coupon bonds		Fixed	Semi-annually, with adjustment of the term in the first flowing period, when applicable	5 and 10 years	First day of January
NTN-B (Notas do Tesouro Nacional série B)	Inflation-linked coupon bonds	IPCA Price Index	Inflation-Linked	Semi-annually, with adjustment of the term in the first flowing period, when applicable	3, 5, 10, 20, 30, and 40 years	
NTN-C (Notas do Tesouro Nacional série C)	Inflation-linked coupon bonds	IGP-M Price Index	Inflation-Linked	Semi-annually, with adjustment of the term in the first flowing period, when applicable		No longer issued

Comments: Number of Days: Business days of the security/252

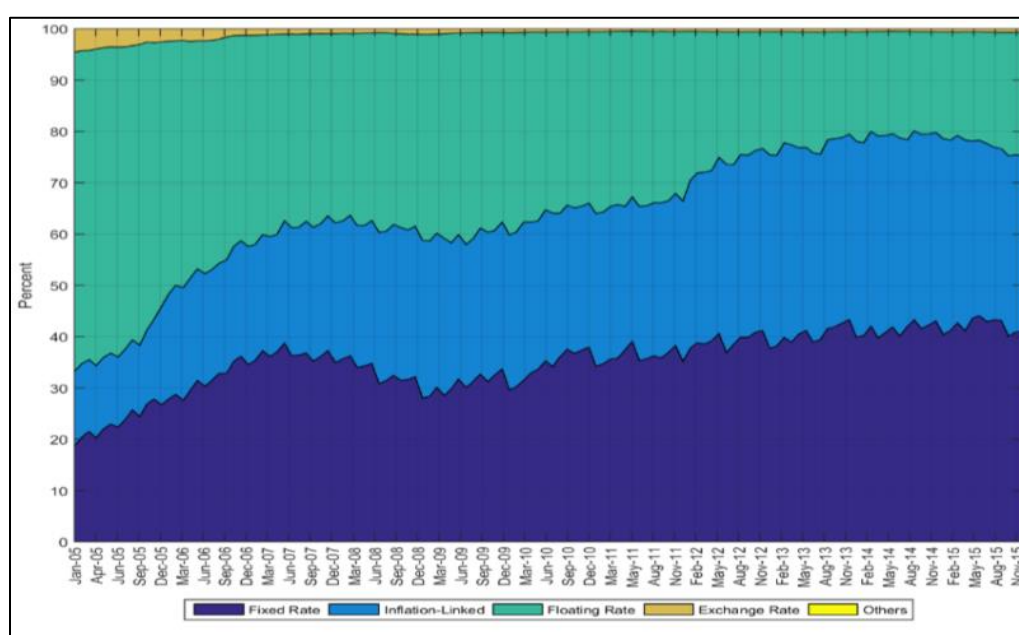


Figure 36 Profile of Government Bonds (2006 – 2015)

Equity: Brazil has one of the largest stock market capitalizations in Latin America. By the end of 2015, total equity market capitalization was BRL 1.9 trillion (US\$ 490 billion), representing 37.8 percent of GDP, with a diversified investor base including individuals, institutional investors, financial institutions, private and public companies, and foreign investors.

Brazil's equity market grew rapidly in terms of market capitalization until 2007, when the equity market capitalization was BRL 2.48 trillion, representing 102.18 percent of the GDP. With the global financial crisis in 2008, Brazil lost equity market capitalization by about 45 percent. Its highest value over the past 10 years was BRL 2.57 trillion in 2010. Since 2012, Brazil has seen its total equity market capitalization drop by about 24 percent, from BRL 2.52 trillion to the current BRL 1.91 trillion.

Despite Brazil's large market capitalization, turnover ratio, and a number of listed domestic companies, the country was considered to rank poorly in terms of transparency and corporate governance just a few years ago. In 2000, with the hope of encouraging corporations to adopt higher standards for corporate governance, Brazil's main stock exchange — BM&FBOVESPA, also known as São Paulo Stock Exchange adopted transparency, and minority shareholder protection, as pre-requisites for listing.

Bank Funding: The main fundraising instruments for banks in Brazil are, traditionally, demand deposits, term deposits, and savings. Over the past decade, the large and growing bank funding market has become more diversified with the introduction of the Financial Bill (*LF – Letra Financeira*) in 2010 and the Time Deposit with Special Guarantee (*DPGE – Depósito a Prazo com Garantia Especial*), in 2009. With the expansion of the menu of available financial instruments in recent years, the importance of funding through LFs has increased, although the Bank Certificates of Deposits (*CDBs – Certificados de Depósito Bancário*) still represent the primary source of funds in this segment. The increase in the share of LFs and DPGEs partly reflects characteristics of these instruments, such as tax exemption and protection by the Credit Guarantee Fund (*FGC – Fundo Garantidor de Crédito*). Since 2012, state-owned banks have expanded rapidly and now make up half the banking system. They rely on subsidized financing for direct lending, which accounts for over half of total credit. The authorities plan to reduce the reliance on state subsidies gradually as part of fiscal adjustment but need to weigh the effects on corporate balance sheets and asset quality. Corporate debt constitutes almost one-third of bank assets and banks' exposure to problem loans of large corporates is high. Banking system soundness indicators remain adequate, but the deteriorating economic situation and the impact of the ongoing scandals on the corporate sector may affect asset quality adversely. Credit risks have risen in the current recession with a slight deterioration of the quality of loans.

Corporate Bonds (Debentures): Companies do not need to issue stocks to raise financial resources. Instead, they may find it more advantageous to issue either debentures or commercial papers. These securities represent cheaper sources of financing when compared to bank credit, with more flexible maturities. Some of the most profitable bonds/debentures in 2016 include: (i) EDP @ IPCA + 8.26%, CPS @ CDI + 2.5%, Vale @ IPCA + 6.62% and sovereign bonds @ IPCA + 6% to 7.2%.

Credit Bonds: Although the credit bonds market is still small in Brazil, it has grown significantly in recent years. By the end of 2015, the amount outstanding in this market was BRL 89 billion, from BRL 6 billion in 2005. The Bank Credit Note (*CCB – Cédula de Crédito Bancário*) has been the main instrument. The amount of CCBs increased from BRL 3 billion in 2005 to BRL 38 billion in 2015. Meanwhile, the amount of Export Credit Notes (*NCEs – Notas de Crédito à Exportação*) increased from BRL 1 billion in 2005 to BRL 38 billion in 2015.

5.7.3 Barriers to long-term investments

Indeed, the government securities market in Brazil is widely developed and, as the basic interest rate in Brazil (SELIC) exceeds similar rates prevailing in the rest of the world, these assets are highly attractive to domestic and foreign investors. As a result, banks and pension funds invest massively in Brazilian Treasuries and have negligible participation in financing long-term assets or infrastructure. Because Brazil has not developed a secondary market for private or corporate bonds, savers have concentrated resources in government debt, which offers a profitable and much more liquid secondary market. In addition, commercial banks charge very high mark-ups, turning real interest rates of commercial loans in Brazil among the highest in the world, above 20% for corporate loans. As a consequence, there is no market reference for long-run interest rates with a duration compatible with projects-based investment. The Brazilian interest rate curve is characterized by a high level of

short-term rates and upward sloping format—long-term rates do not have sufficient liquidity, and short-term rates are very high.

The new government of Brazil is committed to addressing these issues and has engaged in a severe macro-fiscal adjustment, which includes reforms able to decrease and stabilize the growth of the public debt to eventually reducing short-term interest rates. Meanwhile, the share of resources that commercial banks and institutional investors have been allocating to project financing, either in loans or bonds, has remained very limited and mainly concentrated on refinancing projects that are already operational, thus with a lower risk profile. Regarding commercial Banks, the implementation of the Basel III regulations is expected to reduce even more their ability to invest in high-risk assets. Another issue is the market's ability to accept long-term bonds. Despite the need for adequate financing of investments with long maturation period, debentures issued since 2000 have maturities under six years on average. After the 2008 economic crisis, the average maturity fell even more, from six to four years.

5.7.4 BNDES financial instruments for climate finance

Between the main financial instruments, BNDES offers specific conditions for support for the environment for different target groups and different financial terms: a) Non-reimbursable funds concerning Social Fund and Amazon Fund with R\$ 200 million that targeted a 20% of agroforestry systems; and b) Reimbursable Funds concerning Climatic Fund and FINEI Environment with R\$10 million for enterprises.

The Amazon Fund is one of the biggest and most important world initiatives to fight deforestation and a key part of Brazil's commitment to eradicate illegal deforestation by 2030. In its eight years of operation, the Amazon Fund has earmarked around R\$ 1.4 billion for 89 projects from different segments and areas of the Legal Amazon region. All funds are non-reimbursable and destined for projects to prevent, monitor and fight deforestation and to promote conservation and sustainable use in the Legal Amazon region. Managed by the Brazilian Development Bank (BNDES), the Amazon Fund has funds from three sources. The Norwegian government contributed the largest share, around 97.4% of the total (approximately R\$ 2.77 billion). The German government contributed 2.1% (about R\$ 60.69 million), and Petrobras contributed 0.5% (R\$ 14.7 million).

The Brazilian Ministry of the Environment plays a strategic role in the participatory management of the Amazon Fund. It chairs the three-way Steering Committee (COFA) which comprises the federal government, state governments, and civil society. COFA is responsible for establishing guidelines and criteria for investing funds, as well as regularly approving information on the Amazon Fund. COFA also oversees the alignment of initiatives supported by the Amazon Fund, in accordance with the guidelines of the Plan for Prevention and Control of Deforestation in the Legal Amazon Region (PPCDAm) and the National REDD + Strategy (ENREDD +).

The Amazon Fund supports projects by the federal government and state and local governments, third sector organizations, universities and even an international project – Monitoring Forest Cover in the Amazon Region, of the Amazon Cooperation Treaty Organization (ACTO), which comprises eight countries (Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela). The following areas are supported by the Amazon Fund:

- Management of public forests and protected areas.
- Environmental control, monitoring and surveillance.
- Sustainable forest management.
- Economic activities developed from the sustainable use of vegetation.
- Ecological and economic zoning, land planning and regularization.
- Conservation and sustainable use of biodiversity.
- Restoration of deforested areas.

Since 2009, 89 projects have been supported by the Amazon Fund, and currently, there are 10 projects under analysis. The states with the highest number of projects are Pará (14), Mato Grosso (13), Amazonas (9) and Acre (9), but there are 31 other projects involving more than one state. Third sector organizations hold the largest number of projects (47), followed by states (21), cities (7), the federal government (7), universities (6) and international (1).

5.8 Response to GCF investment criteria

5.8.1 Impact potential

The project will contribute to five Adaptation and three Mitigation Fund Level Objectives and Results.

Adaptation (A1, A2, A4, A5 and A7)

Water is considered the limiting factor for agricultural and animal husbandry in the Semiarid. Nevertheless, the water debate should be focused not on absence but on how to preserve water during the rainy season, and how to use it efficiently during the rest of the year. Component II will work with water harvesting techniques which have been widely applied in the Semiarid region. Component I will develop and disseminate agroforestry systems. This set of technologies will be implemented to help promote a shift from the conventional ‘productivist’ culture in the NEB towards CRPS, so that the infiltration can occur naturally making the springs perennial and developing a biological water reserve in the soil, roots and leaves of specialized vegetation.

Studies^{227,228,229} suggest that stratified systems are more resilient to extreme climatic conditions than annual crops and tree-crop monocultures, as they have several mechanisms to reduce the impact of droughts, such as buffering of humidity, reduction of air and soil temperature extremes, windbreaks and shelterbelts to slow wind speed and minimize water loss from evapotranspiration. Stratified, diversified, and densified cultivation increases the photosynthetic capacity of the land and, therefore, the volume of biomass per cultivated area, improving water circulation and promoting an improvement in the microclimate.²³⁰ The idea is to combine different plants into a system that is able to perform photosynthesis the entire year-round, and thus regularly produce biomass and accumulate water. It is important to emphasize that with active management; the whole system re-sprouts vigorously, generating more resistance for the dry periods.

The following adaptation benefits are anticipated by the project:

- 1,000,000 people (being 40% women and 50% youth) will benefit from the adoption of diversified, climate resilient livelihood options (including fisheries, agriculture, tourism, etc.) representing 3.7% of the total population of the northeastern semiarid region of Brazil;
- 53,600 households will be food secure (including during drought periods) (assuming 80% success rate)
- 28,800 families will have water available for production (assuming 80% success rate)
- 36,000 hectares of *Caatinga* ecosystems will be protected and strengthened in response to climate variability and change
- working groups will be operational to strengthen institutional and regulatory systems for climate-responsive planning and development
- 75,000 vulnerable households will use tools, instruments, strategies and activities to respond to climate change and variability.
- 26,800 households will increase their production and earnings

Mitigation (M4, M6 and M9)

The project will contribute towards the shift to low-emission sustainable development pathways by obtaining reduced emissions from land use, deforestation, forest degradation, and through sustainable forest management, and conservation and enhancement of forest carbon stocks. CRPS principles and practices will help eliminate the slash and burn as a method of land clearing and will bring about a significant increase in biomass production and carbon sequestration.

²²⁷ MAMEDE, M.; ARAÚJO, F. Effects of slash and burn practices on a soil seed bank of *Caatinga* vegetation in Northeastern Brazil. **Journal of Arid Environments**, n. 72, p. 458 - 470, 2008.

²²⁸ BRANCA, G. et al. **Climate-Smart Agriculture: A Synthesis of Empirical Evidence of Food Security and Mitigation Benefits from Improved Cropland Management**. Rome: FAO, 2011. 35 p.

²²⁹ MICCOLIS, A. et al. **Restauração Ecológica com Sistemas Agroflorestais: como conciliar conservação com produção. Opções para Cerrado e Caatinga**. Brasília: Instituto Sociedade, População e Natureza – ISPN/Centro Internacional de Pesquisa Agroflorestal – ICRAF, 2016. 266 p.

²³⁰ LASCO, R. D.; DELFINO, R. J. P.; ESPALDON, M. L. O. Agroforestry systems: helping smallholders adapt to climate risks while mitigating climate change. **Wiley Interdisciplinary Reviews: Climate Change**, v. 5, n. 6, p. 825 - 833, 2014.

Practices such as fodder storage, pasture rotation and reduction of free-roaming livestock will be promoted to implement the proposed CRPS. Stratified systems with trees can provide benefits to ruminant herds on farms, since trees can be a source of shade and shelter, improving productivity by reducing heat stress in tropical climates. In addition, some tree species produce leaves and pods, which are highly palatable to animals and are available during the dry season when pastures are of low nutritional quality. Fodder from native trees of the *Caatinga* improves weight gain and milk production.²³¹ Well managed pastures can improve the ecosystem services provided by the *Caatinga*, such as micro-climate regulation, carbon sequestration and fixation, pest and disease control, provisioning of water, the decomposition of wastes, natural pollination of crops and other plants and provisioning of raw materials (such as timber, oil seeds and fruits).

The estimated impact to be achieved by the project is the following:

- 24,800 households reporting adoption of environmentally sustainable and climate-resilient technologies and practices (assuming 80% success rate)
- Between 11,086,999 and 11,621,173 tons of carbon dioxide equivalent (t CO₂ eq) reduced or avoided (including increased removals) - forest and land use
- 268,000 Semiarid region inhabitants use climate information products/services in decision-making, in climate-sensitive sectors
- At least 40% of the families benefited by productive projects report an increase in production
- 84,124 hectares of land under improved and effective management that contributes to CO₂ emission reductions

Further expected impacts concerning other relevant economic, financial and productive indicators (example: an increase in economic and financial benefits, expected increase in household incomes), are presented above, in section 5.3.3 - Financial analysis of the proposed models.

5.8.2 Paradigm shift potential

Potential for scaling-up and dissemination

The project will promote a shift from the predominant monoculture and the top-down application of static technological packages to the promotion of farmer-led technology development and implementation of dense, stratified and diversified systems (what we call CRPS) which will enable farmers to adapt effectively to the impacts of climate change. These systems have not yet been absorbed by the mainstream technical advisory services providers, and successful examples are few and sparse, with limited exchange among them.

More efficient water management linked to the restoration of vegetation cover will produce significant synergies for carbon sequestration, crop yields and landscape organization that will already show positive impacts in the short run during the project implementation, and will provide even higher benefits and positive effects for livelihoods over time. The results in terms of adaptation for farming families, higher yields, carbon sequestration, etc. should enable a paradigm shift not only amongst farmers but also with technical advisory services. The project will scale up the CRPS directly reaching 250,000 family farmers, equivalent to one million beneficiaries in the Semiarid region.

Activities under Component 3 (Knowledge Management), including youth communicators, capacity development, farmer's network, south-south cooperation and policy mainstreaming, will focus specifically on creating conditions required for scaling-up project impacts at the regional level, resulting in the paradigm shift described above occurring in the entire semiarid. This will provide the foundation for multiplying the CRPS with the potential of scaling to an additional 1.5²³² million farming families farmers in the region (approximately 6 million beneficiaries) as well as other drylands farmers in Latin America, such as those from Gran Chaco and the Central American Dry Corridor.

²³¹ ARAÚJO FILHO, J. A. *Manejo pastoril sustentável da caatinga*. Recife, PE: Projeto Dom Helder Camara, 200 p., 2013.

²³² The 2007 Agricultural Census (IBGE) data show that in that year there were just over 1.5 million family farms in the Semiarid region (Cf. INSA- (IBGE). *Estabelecimentos agropecuários do semiárido brasileiro (Censo 2006)*. Campina Grande: INSA/SIGSAB, 3p., 2014. Available at: [http://sigsab.insa.gov.br/static/themes/v1/lib/elfinder/Arquivos/Publica%C3%A7%C3%B5es/Estabelecimentos%20agropecu%C3%A1rios%20do%20Semi%C3%A1rido_S%C3%ADntese%20\(2006\).pdf](http://sigsab.insa.gov.br/static/themes/v1/lib/elfinder/Arquivos/Publica%C3%A7%C3%B5es/Estabelecimentos%20agropecu%C3%A1rios%20do%20Semi%C3%A1rido_S%C3%ADntese%20(2006).pdf)). Based on this data, it is estimated that there are currently approximately 1.75 million family establishments in the region.

The BNDES will be a key stakeholder able to apply the lessons learned from this project to existing credit lines for farmers producing in other biomes in the country, thus proving the replication on a national scale. BNDES has the means to encourage successful entrepreneurs supported by the Project to expand their tools and services to family farmers beyond the semiarid, a potential market of over 4 million family farmers (16 million beneficiaries).

Potential for knowledge sharing and learning

A guiding axis of this project will be the experimentation and dissemination of methodological and technological innovations in the implementation of productive systems resilient to climate change. In this process of stimulating innovation, the Project methodology will strive for constant exchanges of knowledge and practices, inspired by the principles of popular education,²³³ whether in the form of workshops, meetings, exchanges or collaborations that highlight the talents and skills of farmers at the local and regional levels.

It is important to emphasize that exchange visits between communities and territories will be fundamental strategies to spread successful experiences that can serve as reference points in the social and environmental development of local communities. These exchanges go beyond the local and regional level: the project will make an effort to strengthen ties between countries in the southern hemisphere through “learning routes” that will result in the creation of a database, an internet portal and various materials that reveal the connecting links between experiences that ensure greater resilience to climate change in different parts of Northeast Brazil, Latin America and Africa.

One aspect that will strengthen the proposed methodological approach is the use of social communication methods. The media will have a pedagogical function, helping to disseminate new information during the multiplication phase of learning, so that it can qualify and give visibility to educational actions. Since the systematization of innovations is a vital aspect of the communication process, the recording and systematization of ‘good practices’, especially those that are carried out by women and young people within communities, will be key elements in strengthening the learning processes cited here.

An innovative aspect of the TA system proposed under this project is the “Campesino a Campesino” (or “Farmer to Farmer”) approach. It involves the valorization of the ‘local talents’, based on the choice of some people who stand out as references in sustainable knowledge and practices and who will be validated from work carried out together with the hired technicians of the institutions and partner organizations. Rural development projects in several Latin American countries that have been characterized by the “Campesino e Campesino” methodological approach have shown to be particularly successful in stimulating simple, non-culturally invasive agroecological practices that improve upon careful observation of experiments at the empirical level. At the same time, the process of implementing thousands of CRPS of various types will be an instrument that will significantly contribute to the learning of technical advisory teams who will work with Project beneficiary families. This process should also enable the promotion of CRPS to become part of the institutional axis of rural technical advisory bodies.

²³³ The principles of popular education that guide the educational and organizational processes of this Project are based on the teachings of the Brazilian educator Paulo Freire: (i) the validation of popular and native forms of knowledge, rather than theoretical and conceptual thoughts and ideas imposed “vertically”; (ii) the exchange of beliefs, concepts and practices among the participants as a foundation, to be complemented by the intervention of outside figures, affirmed as “experts”, such as technical advisory services agents; (iii) the creation of “tools” (such as audio-visual and written materials) that arise from the communities’ needs and demands and are written/created using their own terms and expressions.

Contribution to the creation of an enabling environment

The first important legacy of the Project in creating an environment that is conducive to resilient and low carbon development will be the introduction of new practices and technologies for farmers in the Northeastern Semiarid. CRPS, which incorporates practices of greater resilience and climate change adaptation, will focus on increasing production stability by adopting sustainable management of available natural resources (water resources, soil, native vegetation, genetic resources in agriculture and livestock) and balancing higher commercial production with diversification and sustainable self-consumption. Thus, the Project's actions will help to develop and disseminate various types of well-performing agricultural production systems with resilience and climate change adaptation characteristics managed by thousands of farmers.

This process will allow several public and private technical advisory and research entities to gain experience in the design and implementation of more resilient and adapted agricultural production systems (CRPS). In this regard, the Project will invest in improving the technical capacity and knowledge of government and private rural advisory agencies, farmers' organizations and farmers themselves on adaptive approaches to agroecosystem management. The paradigm shift driven by the Project depends on a coordinated approach, and the Project will foster an enabling environment for coordination among the various stakeholders, favoring complementarities between the public and private sectors for the implementation of CRPS.

The process triggered by the Project will enable farmers to develop their capacities to manage their agroecosystems sustainably. This means that a set of private sector social actors can play a prominent role in the development process of the semiarid region. Thus, it will be these social actors who will implement the new, more productive and resilient systems, enabling the strengthening of their livelihoods, with an adaptation to climate change. It is understood that this scenario will serve as a stimulus for these actors to continue working with these systems in the long term and that this will encourage other producers to adopt such practices after the end of the Project. The fact that there are seed banks and nurseries in operation, thanks to the Project's action, should feed the continuity of the functioning of the implanted systems and favor the dissemination of these resilient and adapted systems.

As the Program has contributed to the creation, experimentation and production of new tools and equipment that can facilitate the management and decrease the operating costs of CRPS, there will be a group of local companies that will be able to offer these instruments in the market, which should strengthen the consolidation and expansion of this type of system.

Considering the positive results obtained with the implementation of these innovations, it is expected that banks that offer credit to rural producers will finance the implementation of resilient and climate-resilient agrosilvipastoral systems within the framework of rural credit programs.

The growth in the production of herds, cultivated areas, orchards, and *Caatinga* extractivism will strengthen the various production chains that work with these products from the semiarid region. Greater ease of access to markets will provide an incentive for households to seek to expand their areas under this new management.

In addition, the Project will enhance the sustainability of its effects by creating opportunities for better coordination of public policies and government programs to support resilience and adaptation to climate change. It is expected that government institutions will continue to invest in the different initiatives catalyzed by the Project, and adaptation measures will be integrated into different plans and programs. In addition, it is expected that access will be facilitated to credit, which should ensure investments to catalyze adaptation and mitigation impacts. In this context, it should be noted that in Brazil there are, in addition to the most common policies such as agricultural credit, various policies/plans that relate directly to the issue at hand, and which should reinforce the continued and growing participation of the multiple sectors of society in the processes of resilient development. Here are some of the key initiatives:

- a) The National Plan on Climate Change - PNMC;
- b) The National Climate Change Adaptation Plan (PNA) (launched in 2016);
- c) The REDESER Project, which is a multi-institutional initiative led by the MMA, aimed at the installation of Degraded Areas Recovery Units (URADs).
- d) There is also the ABC Plan - Low Carbon Agriculture Plan.
- e) The Forest Code and the National Plan for the Recovery of Native Vegetation (PLANAVEG).

The project's design was designed to increase the complementarity of the actions of public and private actors to support the implementation of a more resilient agricultural model adapted to climate change in the Brazilian Semiarid. It will be the private sector - especially the region's farming families - that will implement the innovative systems. The hiring of TA services from private or public entities points to another dimension of complementarity. Project support for other private sector actors - such as tool and equipment manufacturers or the production and supply of seedlings and seeds - reinforces this perspective. In this model, the public sector assumes the role of facilitator, while private actors take responsibility for implementing the actions needed to improve the sustainability of their livelihoods in their various dimensions. This complementarity seeks to reinforce the deployment of a type of development capable of ensuring both prosperity and resilience at the same time.

Contribution to the regulatory framework and policies

The Project will help Brazil achieve its NDC and the targets of the Low-carbon Agriculture Program (ABC). CRPS principles are a viable option for smallholders to fulfill their legal obligations under the Brazilian Forest Code (FC). The Project will support beneficiaries to overcome the challenges they face (e.g., lack of technical support and incomplete fiduciary documentation) to fully comply with the national regulatory framework.

The project will strengthen regulatory frameworks by implementing the instruments established in the Brazilian Forest Code (Law 12651/2012). The Forest Code governs the use and protection of private lands in Brazil. It is one of the most critical pieces of legislation with the potential to drive efficient land use in Brazil and, in doing so, become an effective tool against climate change.

Under this Code, rural properties play an important role in biodiversity and natural resource conservation, as owners must maintain 20% native vegetation of their total land area in the *Caatinga* Biome. These “Legal Reserves” (LR) are intended to preserve forested areas and their ecosystems, thus contributing towards an enhanced ecological balance and avoiding deforestation emissions. In addition, rural properties have to map and leave Permanent Preservation Areas (APP in Portuguese) intact, being areas that have been designated for protection because they have been identified as critical to the preservation of essential ecosystem functions, such as the preservation of water resources, landscapes, geological stability, biodiversity, genetic flows for fauna and flora, soil protection and safeguarding the wellbeing of human populations. Examples of APPs are riparian zones, springs, hilltops, steep slopes and mangroves. Each rural landholding is thus required to have an environmental rural registry (CAR – the Portuguese acronym), which is an electronic register of georeferenced information about a rural property. The CAR integrates environmental information regarding the property (such as the LRs and APPs) to assist in monitoring and combating deforestation and degradation of native vegetation in private rural properties. The CAR is essential to access rural credit from financial institutions.

However, many properties have yet to meet these requirements: they either don't have a CAR yet, or there is a deficit regarding the LR or a degraded APP that ceases to provide environmental services. Embrapa researchers found that family farmers face some particular barriers when it comes to the implementation of the forest code such as low education level of the farmers, lack of technical support, and incomplete fiduciary documentation²³⁴. The small size of these farms is also an issue, as preserved areas are not fully available for cropping and grazing. In this general context, the extension agents providing support to the farmers in this Project will work with all beneficiaries to ensure they become (are) fully compliant with the forest code. Smallholding family farmers are entitled to a slightly more flexible rule, that enables them to include certain types of production within their LR. According to research, the CRPS principles proposed by the Project are a viable option for smallholders to both fulfill their legal obligations to conserve and/or restore land within the Forest Code and maximize livelihoods and other benefits²³⁵. The CRPS proposed here are entirely aligned with the Low-Carbon Agriculture (ABC) program.

²³⁴ LOPES, S. R. M.; BRIENZA JR., S. **A Regularização Ambiental e o Agricultor Familiar na Amazônia Legal a Partir da Lei Nº 12.651 de 2012**. Belém, PA: Embrapa Amazônia Oriental, 2017.

²³⁵ MICCOLIS, A. et al. Restoration through Agroforestry: Options for Reconciling Livelihoods with Conservation in the Cerrado and Caatinga Biomes in Brazil **Experimental Agriculture**, n. 2017 - Online. Available at: <https://doi.org/10.1017/S0014479717000138>, p. 1 - 18, 2017.

The Forest Code also established another instrument that has only been implemented by one state in Brazil (Mato Grosso do Sul), the *Cotas de Reserva Ambiental* (CRA, Environmental Reserve Quotas)²³⁶. The CRAs²³⁷ are a market mechanism of offsetting that can be an effective conservation tool for rewarding farmers that sequester carbon or avoid deforestation emissions²³⁸. This CRA market could potentially reduce the country's overall LR 'debt' by 56%²³⁹. Given the high costs of forest restoration, the exchange of CRAs could become a cost-effective way to facilitate compliance, meanwhile protecting forest surpluses that might otherwise be legally deforested. Balanced use of CRAs should focus on improving functional and ecological attributes of forested landscapes, e.g., habitat integrity (and thus biodiversity), carbon stocks, and water balance regulation.

The Project will fund activities designed to facilitate the development of a roadmap to implement the CRA market. Depending on these roadmaps, additional studies may also be financed by the Project to define priority areas, flexible compensation rates, ecological value, among others. In addition, all families participating will obtain the CAR, an instrument that is crucial for the implementation of the Forest Code.

The Low-carbon Agriculture (ABC) program and the Forest Code are the two most important instruments for achieving the NDC. Once state regulators and extension agents understand the possibilities and benefits of the CRPS principles implemented by the Project, they will be better equipped to oversee and support the implementation of the new Forest Code (to other non-beneficiaries of the project) and the ABC program, therefore generate consistent services and policy.

Overall contribution to climate-resilient development pathways, consistent with relevant national Climate Change Adaptation strategies and plans

The project will promote a shift from the predominant monoculture agriculture and top-down application of technological packages to the promotion of farmer-led technology development of CRPS. More efficient water management linked to the restoration of vegetation cover will produce valuable synergies for carbon sequestration, crop yields, and land management, producing huge benefits and positive impacts for livelihoods. Farming adaptation results should enable a paradigm shift not only amongst farmers but also with technical advisory services.

5.8.3 Sustainable development potential

Economic and social co-benefits

IFAD's core mission is to enable rural poor people, who are the most vulnerable to climate change, to overcome poverty themselves. The Project will enable the transition of 1,000,000 people, smallholder farmers and their families, to increase their resilience in an extreme climate environment, through improved CRPS and water access.

It will also create employment opportunities, as local economies are fostered and stimulated by its investment to promote rural entrepreneurship activities. There will be long-term macro-level indirect economic benefits derived from the project's contribution to food security and self-sufficiency. Reducing the vulnerability of farming households will also reduce the likelihood of such households needing relief assistance and/or safety-net pay-outs.

The project will ensure youth and women's participation in community decision-making, as this *modus operandi* is central to IFAD's operations and support to policy dialogue and south-south cooperation.

²³⁶ GASPARINETTI, P.; VILELA, T. **Implementando Mercados de Cotas de Reserva Ambiental (CRA): Desafios e oportunidades para as Regulamentações Estaduais**. Documento de Discussão. Available at: http://www.observatorioflorestal.org.br/content/uploads/2018/05/PORT_documento_de_discussao_CRA_CSF_Fev2018.pdf. Conservation Strategy 2018.

²³⁷ Each Forest Reserve Credit represents one hectare (1 ha) of forest Legal Reserve, that is surplus to the amount required by law to be maintained in any given rural property.

²³⁸ The CRA market can potentially reduce the country's overall Legal Reserve 'debt' by 56%.

²³⁹ SOARES FILHO, B. et al. Cracking Brazil's Forest Code. *Science*, v. 344, p. 363 - 364, 2014.

All measurable benefits arise from addressing problems such as: (i) decrease in incomes resulting from increased costs of forage purchases when a climate change event occurs; (ii) decreased productivity due to the high pressure on native grazing; and (iii) expansion of degraded lands and unsustainable practices.

The following quantitative economic co-benefits can be pointed out:

- At least a 15% increase in vulnerable household's income as a result of CRPS, thus contributing to poverty alleviation in the region.
- At least 23,000 ha of degraded or monoculture lands turned out into diversified and integrated agroforestry models.
- 36,000 vulnerable farmers are benefiting from increasing water access.
- Estimated increase in local fruit production of 78,000 tons after a 10-year period, improving the availability of fresh fruits for the local population, improving local consumption and nutrition levels.
- 70 local micro-enterprises strengthened, generating 200 local jobs for rural youth to support resilient productive family farming.
- Families in sustainably managed collective areas diversify their sources of income with other income generation activities and reduce timber extraction.
- 67,000 family farms participating in CRPS reaching an increase in biomass production of at least 50.000 kg/ha after a 10-year period.
- At least 1,080 small-holder households save between R\$ 80 and R\$ 104 per month in firewood / LP gas purchases for cooking, due to the implementation of efficient and ecological systems (stoves and biodigesters).
- Efficient and ecological systems (stoves and biodigesters) will also bring health benefits for these 1,080 families because they are smoke-free.
- At least 36,000 ha of collective areas benefit reducing CO2 emissions and improving families' livelihoods.

Qualitative benefits rely on (i) social-capital enhancement and improved cohesion to increase empowerment in targeted groups, (ii) improvements in food security, nutrition and health by increasing self-consumption of more in-farm natural fruits and vegetables.

Environmental co-benefits

Ecosystem restoration through CRPS offers compelling synergies between mitigation and adaptation to climate change, given that they improve the resilience of small-scale farmers through more efficient water use, soil conservation, improved microclimate, increased soil water content, control of pests and diseases, as well as improving farm productivity, beekeeping, and provide greater thermal comfort for animals, while sequestering carbon at the same time.

In addition, they help preserve the *Caatinga* ecosystem by increasing organic matter; improve pastoral management by adjusting stock rates; improve the management of native vegetation; and rationalize forest management, through selective logging, regrowth management and the redistribution of nutrients in the agro-ecosystem. It also diversifies production, increases land productivity and improves income and quality of life for farmers and their families. The system works for the protection of springs (riparian) and the reduction of water losses to provide continued access to water.

In short, the 90,000 ha of agroforestry systems funded by the Project and implemented by the family farmers will bring multiple environmental co-benefits, such as:

- ***Caatinga restoration.*** AFS can promote recovery of the original *Caatinga* ecosystem in at least two ways. 1. by integrating sustainable forest management within the same area of production; and 2. by naturally intensifying production in certain areas of the farm, which allows farmers to release key areas for restoration and conservation of the *Caatinga*.
- ***Stabilization of the agricultural frontier.*** Agroforestry allows a natural intensification that lengthens the time that crops can be grown on a given piece of land and increases crop productivity. Better soils

lead to better yields and higher efficiency, reducing the need for more land while providing a sustainable supply of firewood.

- **Improvements in ecosystem services.** The vertical structure of agroforestry systems supports significant levels of biodiversity and provide ecosystem services such as natural pest management, carbon sequestration, water and soil conservation, nutrient cycling, hydrological protection and crop pollination.
- **Improved water-use efficiency.** Leguminous trees in agroforestry systems have been shown to considerably enhance rain-use efficiency (the ratio of aboveground net primary production to annual rainfall).
- **Improved landscape integration.** The tree-rich matrix of agroforestry systems acts as a buffer for remnant natural forest fragments, ameliorating edge effects, improving landscape connectivity, and extending source habitat for a subset of the regional species pool.
- **Improved sustainability of land management** as a result of both ceasing fire for land preparation and integrating *Caatinga* vegetation into cropping and grazing systems that initiate the process of rebuilding soil fertility and also restoring agroecosystem functions.

Gender, traditional communities and youth-sensitive development aspects

In order to adopt a gender-sensitive rural development approach, 40% of technicians hired to perform technical assistance services in communities, including 'experimenting farmers' or 'local talents', must be women, which will facilitate greater protagonism of the female population in the planned actions. In the planned courses, meetings and exchanges, there will be an effort to maintain equity between men and women in the target audience. The proportion of 50% of women will be more easily maintained through the “*cirandas*” initiative for childcare during the planned activities.

The gender assessment revealed that women have less access than men to both tangible productive resources (land, credit, housing, and basic services) and intangible resources (education, technical assistance, political participation). The project will promote gender equality by providing access for rural women to the productive resources needed for agricultural development. The project will build women's leadership skills, foster their participation in decision-making processes, and assist women in accessing credit and technology for production and commercialization.

In practical terms, with regard to TRIPs, the Project will ensure that at least 40% of family farms can count on women and young people in their implementation cycle. It should be emphasized that building partnerships with gender reference organizations should be fostered as a way of facilitating gender mainstreaming with a feminist approach in the AT system, as these organizations can provide methodological approaches that support local and regional processes.

In order to guarantee women's economic autonomy, a fundamental guideline of the Project will be the promotion of specific training activities that ensure the incorporation of technologies based on the 'learning by doing' pedagogical approach, promote value addition and facilitate the exchange of knowledge about management aimed at the organization of housework and care. The educational approach adopted in local workshops and territorial meetings between women farmers will be inspired by 'feminist pedagogy', and its main objective is to foster a broad process of Environmental Education, seeking connections between feminism, women's rights, the *Caatinga* Biome's specificities and agroecological principles.

Although diversification is considered a primary principle of CRPS to be incorporated into the approach used by TA teams, it does not necessarily guarantee that household diets within the coverage area are more varied, as there is often a disconnect between production practices and Consumption habits. Thus, in order to improve the nutritional quality of families' diets, an action plan will be carried out with women lunch makers in the context of the PTIRs that will be developed within the EFAs and schools. The proposal is to convey information about the value of native plants and foods in local and regional culture, as well as encourage the creation of new recipes for school meals and encourage the establishment of seed banks within public facilities and local communities, targeting women who have traditionally taken care of food and socio-biodiversity practices within these environments.

Dissemination of climate information will apply gender considerations, and local governments will be trained to ensure that financial support can flow to activities that meet the needs of women.

The Project's gender focus will ensure better opportunities for women and youth in all three components. These implementation measures will:

- 400.000 women (40% of total beneficiaries) to have access to project benefits,
- Of these, 230.000 will access CRPS.

The full Gender Assessment and Project-level Gender Action Plan are provided in Annex 8 of the Funding Proposal.

As traditional communities (quilombolas, Funde Pasto and indigenous communities) are more vulnerable to situations of extreme poverty and manifest greater fragility in their organizational processes, a priority of this Project will be the reinforcement of the productive inclusion and local development of such communities. , aiming at social, environmental, cultural and economic sustainability. To this end, the Project will seek to develop specific technical advice approaches that seek to value traditional knowledge about agricultural production modes, extractivism and practices aimed at preserving biodiversity (such as the preservation of 'Creole seeds', for example). It will also seek to strengthen the processes of self-organization and articulation with relevant broader organizations, including in order to support these groups in guiding the land regularization processes in which they were eventually involved. The particularities of the methodological approach to technical assistance for traditional communities should be fully incorporated into all activities performed by TA teams working with these groups. In the case of indigenous groups, in addition to the aspects mentioned here, all Project activities with them must be framed by the FPIC Plan.

With regard to rural youth, the Project will develop two lines of action in order to create more opportunities for this segment, giving priority especially to young women, who tend to be even more excluded than young men in the processes of productive organization. The first action guideline focuses on providing opportunities for professional qualification courses, focusing on encouraging multi-activity and diversified production systems such as those based on agroecology. Such activities aim to strengthen their entrepreneurial capacity, serving as a form of preparation for the professional field, but at the same time, they should keep them linked to the universe of small-scale agricultural production.

The second guideline involves the use of media resources to encourage young people's interest in the full range of agricultural and non-agricultural activities offered by the countryside. A network of 'young communicators' will be fostered who will act at the local and regional level, assisting the audiovisual recording processes and participatory systematization of the actions developed with families, as well as contributing to the production of materials on semiarid themes that consolidate an affirmative image in relation to the rural area, its cultural traditions and the lessons learned in the field of sustainable agriculture. Potentially produced materials will be incorporated into the pedagogical projects of the rural schools, the EFAs and the field education programs in the Project coverage area, as well as serving as inputs for political impact.

5.8.4 Needs of the recipient

Vulnerability of the country and/or specific vulnerable groups

Although Climate Change Vulnerability Index (CCVI) evaluates Brazil as a medium risk country²⁴⁰, the Brazilian Semiarid is the most vulnerable region in South America, exposed to an average annual temperature increase from 4° to 6° C²⁴¹. If current trends are confirmed, the region will become arid by 2050. The targeted area has a very high incidence of prolonged and severe droughts, with the most recent drought cycle lasting approximately five years (2011-2016). Semiarid areas highly susceptible to desertification reaches nearly 200 thousand km² (20% of the region), involving 1,262 municipalities²⁴². In the context of global warming,

²⁴⁰ CAF. **Vulnerability Index to climate change in the Latin American and Caribbean Region**. Caracas. : CAF, 2014. Available at: <http://scioteca.caf.com/bitstream/handle/123456789/509/caf-vulnerability-index-climate-change.pdf>.

²⁴¹ IPCC (2014). Central and South America. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. In: Barros VR et al. (Eds), Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA, p. 1499-1566.

²⁴² VIEIRA, R. D. S. P. et al. Identifying areas susceptible to desertification in the Brazilian Northeast. **Solid Earth**, v. 6, p. 347 - 360, 2015.

communities' high dependency on crops raises the regional vulnerability index, which can increment to extreme or high risk levels.

The Project targets the most vulnerable groups to climate change in the country (rural women, youth and traditional communities of the Semiarid), enabling expansion and diversification of income-generating activities. Women are particularly vulnerable to reduction in food and water supplies. Traditional communities (indigenous, *fundo de pasto* and *quilombola*) are also highly exposed, notably to land tenure insecurity, because most of them lack legal titling and recognition of their communal lands.

Economic and social development level of the country and the affected population

Although Brazil is classified as an upper-middle-income economy, with 2017 per capita earning of US\$ 8,580, poverty levels are alarming, and the country has one of the world's highest inequality rates.²⁴³ From 2014 to 2017, poverty has increased by 33%, reaching 11.18% of Brazilians (23.3 million people).²⁴⁴ The target area is the world's most populous dryland²⁴⁵ and the local population is among the poorest in the country - 59.1% of all Brazilians in extreme poverty live in the Northeast (9.61 million people), and the region encompasses 32.7% of municipalities with very high food and nutritional vulnerability (a total of 52 cities)²⁴⁶. Family farmers of the Semiarid face pressing economic and social development challenges, such as low income, limited access to credits, food and water insecurity.

The absence of alternative sources of financing

There is a critical need to bridge existing investment gaps to assure Brazil transitions towards a climate-friendly and resilient development pathway²⁴⁷.

The following key barriers were identified creating the absence of tailored funding for climate change adaptation and mitigation for highly vulnerable rural areas in the Northeast Semiarid: i) rising level of public indebtedness and fiscal imbalances at national and subnational levels, ii) weak investment and deteriorated local credit market, iii) high perceived funding risks for highly vulnerable groups in the targeted region, iv) lack of long-term investment drivers and high intermediation costs, iv) high interest rates. The current Project aims to address these barriers by mobilizing the BNDES – a very important public sector financial entity in Brazil – with a financial instrument composed by a blend of grant and loan that leverages public and private funds, enabling new investments in climate change-related projects.

The need for strengthening institutions and implementation capacity

In the Brazilian semiarid region, there are several deficiencies or weaknesses in what refers to the design/conception and also the implementation of effective actions of implantation of productive and resilient agrosilvopastoral systems, capable of promoting the adaptation of the present systems to the predicted climate changes. There are also difficulties in implementing what the Forest Code determines.

Firstly, the multiplicity of rural actors, coupled with the lack of concertation mechanisms, makes it difficult to coordinate actions. On the other hand, there are also limitations regarding the domain of climate risk issues and resilient systems, both at the level of governmental bodies responsible for designing policies of this type, and at the level of direct execution in the field, which is basically done by advisory providers. Technique In the latter case, the limitations encompass both the domain of the aforementioned problem and the use of participatory methodologies, necessary to mobilize the local population to adapt to climate change. Regarding

²⁴³ ALVAREDO, F. et al., Eds. **World inequality report 2018**: Harvard University Press, p.296, ed. 2018. Available at: <https://wir2018.wid.world/download.html>.

²⁴⁴ Based on the statistics of the Continuous National Household Sample Survey (PNAD), from 2004 to 2014, the extreme poverty reduction surpassed 63%. (NERI, M. **Qual foi o impacto da crise sobre a pobreza e a distribuição de renda?** Rio de Janeiro: Fundação Getúlio Vargas, 2018. Available at: https://www.cps.fgv.br/cps/bd/docs/NOTA-CURTA-Pobreza-Desigualdade-a-Crise-Recente_FGV_Social_Neri.pdf).

²⁴⁵ MARENGO, J. A. Vulnerabilidade, impactos e adaptação à mudança do clima no semi-árido do Brasil, *Parcerias Estratégicas*, 27, 149–75, 2008. Available at:

http://seer.cgee.org.br/index.php/parcerias_estrategicas/article/viewFile/329/323%20%C2%A0.

²⁴⁶ IBGE (2017). Pesquisa Nacional por Amostra de Domicílios Contínua (PNAD). Available at: <https://www.ibge.gov.br/estatisticas/sociais/habitacao/17270-pnad-continua.html?=&t=o-que-e>.

²⁴⁷ OECD. **Financing Climate Futures: The role of National Development Banks in Brazil and South Africa**. OECD Case Study - KEY FINDINGS. Paris: OECD, 2017. Available at: <http://www.oecd.org/dac/environment-development/Financing-Climate-Futures-NDB-Brazil-South-Africa.pdf>

the application of the Forest Code, there have been advances in the realization of the rural real estate environmental records (CAR) and also in the elaboration of the Environmental Regularization Programs (PRAs), which is elaborated when the property presents irregularities before the determinations of the Rural Code. But the difficulties are still very significant regarding the effective implementation of these PRAs.

At the institutional level, by working with various government agencies at the federal and state levels, the Project will contribute to improving the coordination processes between these agencies, providing opportunities for the design and implementation of joint actions. Thus, the Project will contribute to the improvement of planning processes, in order to improve the processes of implementation of initiatives oriented to resilient agricultural production and adaptation to climate change. In this way, the implementation of the Program should help the competent bodies to define better public policies and climate change adaptation programs. The participation of state government agencies (Secretariats of Agriculture, Agrarian Development, etc.) in the implementation of the Project will allow capacity building at this level, previously absent, for the design and implementation of such initiatives. At the same time, the Programme's action will enable the various types of TA providers, both public and private, to gain greater mastery and experience with participatory methodologies and the most productive and resilient agrosilvopastoral systems.

On the other hand, the implementation of these agrosilvopastoral systems should be a powerful instrument in the process of adapting rural properties to the norms of the Forest Code. In this way, the Program will be showing a path for the implementation of PRAs, which should continue after their completion.

The intensive work of monitoring and systematizing the processes and results obtained by the Program should feed into this process of strengthening the different organizations involved and the capacity to implement such initiatives. This institutional strengthening, at various levels, should allow the process of changes in the productive semiarid systems to consolidate and even expand after the end of the Program.

Thus, this Project will play a crucial role in strengthening local, regional and national institutions for education, research and extension, and in regulating strategies to promote climate adaptation and resilience in the agricultural sector. TA will be provided to family farmers' organizations and schools, introducing new concepts and skills linked to environmental sustainability. These initiatives will strengthen the linkages between implementing agencies and organizations in the Northeast, taking advantage of each partner's comparative advantages to maximize mitigation and adaptation benefits as well as other co-benefits (Section D3 of the funding proposal). In addition, South-South Cooperation will facilitate knowledge sharing among other developing countries.

5.8.5 Country ownership

The proposed project is included in the National Strategy for the Green Climate Fund, and it adheres to the two strategic axis and the following investment areas: Adaptation based on Ecosystems and Water Security; Resilience and Sustainability of Indigenous and Traditional Communities; Restoration, Conservation and Reforestation; Low Carbon Agriculture and Adaptation of the Productive Process. The strategy also includes water security as a key priority.

Brazil has an overarching National Policy on Climate Change, which paves the way to the implementation of measures for adaptation and mitigation by the three federative government layers: federal, state and municipal. The National Policy supports the national voluntary commitment of reducing GHG emissions by 36.1% to 38.9% in relation to the projected emissions, until 2020. Regarding specific REDD+ actions, Brazil has an obligation to stabilize emissions at 2005 levels for the *Caatinga* Biome.

In the Nationally Determined Contribution (NDC), Brazil highlights that adaptation is considered a fundamental element to tackle climate change and its effects. The social dimension is at the core of Brazil's adaptation strategy, bearing in mind the need to protect vulnerable populations from the adverse impacts of climate change and enhance resilience.

In this context, the country developed a National Adaptation Plan (NAP), which puts forward cross-sector adaptation strategies to address the wide range of risks that climate change is creating and is the means to implement the adaptation aspect of the NDC. The NAP has also established guidelines to implement adaptive measures aimed at increasing climate resilience in 11 sectors and themes.

The NDC presents the strengthening of the Low Carbon Agriculture Program (ABC) as the main strategy for sustainable agriculture development and commits to restoring 15 million ha of degraded pasturelands, enhancing 5 million ha of integrated cropland-livestock-forestry systems and restoring and reforest 12 million ha of forests by 2030. The ABC Plan is one of the sectorial plans devised under the National Policy on Climate Change. Its overall objectives are: reducing greenhouse gas emissions in agriculture; improving the efficiency in the use of natural resources; increasing the resilience of production systems and rural communities; and promoting adaptation to climate change in the sector.

Brazil has also been reviewing environmental regularization of private rural areas to reduce deforestation and promote sustainable land use practices. The Forest Code has been reviewed in 2012, and Law No. 12.651/2012 reinforces Brazil's commitment to the protection of native vegetation and the integrity of the climate system by establishing restriction for the use of areas of native vegetation on private properties: Permanent Preservation Areas (APP) and Legal Reserve (RL), as defined by the law, must be maintained by the landholders with native vegetation at a proportion of 20% for the *Caatinga* Biome. The Forest Code also included responsibilities for environmental liabilities through a mandatory registration on the Rural Environmental Registry (CAR) for all rural landholdings (Article. 29, Law No. 12.651/2012).

Beyond the revision of the Forest Code, in 2012, a series of advances in environmental policies and laws occurred in the last twenty years. Recently the National Policy for the Recovery of Native Vegetation (PROVEG) was launched with the challenge of implementing the Forest Code in a total area of at least 12 million hectares by December 31, 2030.

The additional Recovery of Native Vegetation Plan (PLANAVEG), launched through Inter-ministerial Ordinance No. 230, dated November 14, 2017 will support the continuation of the implementation of the Forest Code, providing incentives to smallholders, indigenous peoples and traditional communities, having as a basis the information from the National Rural Environmental Registry System (SICAR).

The Brazilian Biomes Environmental Monitoring Program is aligned with the objectives of the ENREDD+ and will deliver the enhancement and improvement of systems and monitoring protocols – particularly for the extra-Amazonian biomes – necessary for achieving the desired national scale combat to deforestation and forest degradation and to foster forest recover using the National Climate Change Fund.

Nevertheless, Brazil has been advancing on setting an enabling environment for the country's priorities for low-emission and climate-resilient development, and recently has had its first successful and exclusive approval of payment for US\$ 96 million for reducing deforestation, degradation or emissions through other REDD+ activities such as conservation, sustainable management of forests or enhancement of carbon stocks (e.g. ecosystem restoration).

5.8.6 Efficiency and effectiveness

Financial structure justification and profitability indicators

As discussed in detail in Section 5.5, under the current scenario of climate funding in Brazil, the project would not be viable, neither for the country nor states, without GCF funding.

The proposed financial elements were selected to render the project viable.

Benchmarks

Considering the GCF finance portion only, the indicator of 'Effectiveness of GCF Adaptation Investment' stands at a cost of US\$ 99.5/ beneficiary. As discussed in section 5.6, when compared to other rural development projects in Latin America, the 'Planting Climate Resilience Project' is well ranked. Even when the entire cost is taken into consideration, the PCR Project lies within the higher effectiveness range of rural adaptation projects in the region.

Another indicator that can be considered is ‘Effectiveness of GCF Mitigation Investment’, measured by the cost of each tCO₂ reduced. In the case of the PCR Project, this cost is US\$ 24.6 / tCO₂eq, which is a low cost when compared to other projects of the region.

Financial indicators

Financial analysis (see section 5.3 Financial Analysis) allows understanding, based on behavioural hypothesis and parameters, if potential beneficiaries will be motivated to take risks and make the investments required by the project. It simulates the incentives and benefits (at the individual and, sometimes, group level) to ensure beneficiaries will have the means to take on the project’s proposal. The analysis uses a realistic approach by making assumptions on the delays in adopting technologies and drop-out rates for entrepreneurship initiatives. Ten models were developed to simulate impacts for each type of intervention on each targeted group of beneficiaries. These models illustrate the range of activities that could be developed by the targeted beneficiaries.

Overall, the financial analysis per model shows positive Net Present Values (NPV), Financial Internal Rate of Returns (FIRR) going beyond the cutoff rate and Benefit-Costs ratio higher than 1, so all models are considered profitable, with FIRR rates ranging from 10% to 39% depending on the supported activity, and net present values (NPV) at the 10% discount rate varying from R\$ 2.322 to R\$ 219,491. For more information, see section 5.3 and Annexe III.

Profitability indicators and cost-effectiveness

The economic analysis considers all the costs and benefits of the Project (with market prices to calculate total economic costs). It allows evaluating the global efficiency in management resources for the government and society. The analysis is made by aggregating the farm models using market prices and adding externalities (that will be represented in this case by the environmental benefits from avoiding CO₂ emissions). It was calculated over a period of 20 years and at a shadow discount rate of 10%²⁴⁸. To incorporate results in the economic analysis, all prices have been calculated applying conversion factors for imported tradable goods, exported goods and labor. No market distortions are supposed to affect non-tradable goods. As mentioned before (section 5.4 Economic Analysis and Sensitivity), the overall Economic Internal Rate of Return (EIRR) for the Project is 19.77%, while the NPV is worth US\$ 152,004,000.

It is essential to highlight that the calculations performed to show that the cost benefit ratio of the Project as a whole – expressed by Project B / C Ratio – is 3.18. This number can be considered a very positive result.

When considering financial benefits at the household level, the average increase in incomes can be estimated at approximately 20%.

As was said before, a sensitivity analysis was carried out assuming different risk scenarios, including different increases in project costs, possible reductions in project benefits, delay in these project benefits and the occurrence of climate change extreme events (every 2, 3 and 4 years).

According to these calculations, the project is assumed to be profitable and resilient as it supports most of the tested scenarios, such as an increase in costs up to 30% or a reduce in benefits of 30%. Even in the case of a mixed increment in costs up to 20% and a reduction in benefits of up to 20%. In these cases, the NPV remains in positive range. The project would not be profitable in the case of a mixed cost increase of 20% and a benefit reduction of up to 30%. This serves to demonstrate that the project is well diversified and not highly exposed to price or sectorial risks.

²⁴⁸ Taking into account 10 year bonds yields for the country (between 9 and 10%).

5.9 Sustainability, up-scaling and exit strategy

The proposed long-term strategy for rural areas of the Brazilian Semiarid builds on the extensive experiences and lessons learned from previous BNDES²⁴⁹ and IFAD²⁵⁰ projects targeting the strengthening of family peasant farming and promoting climate-friendly social technologies in the region. Building on this solid foundation, the project also expects its results will have sustainability beyond the project period.

The following elements, incorporated in the Project design, contribute to the sustainability, durability, and scalability of its impacts after development assistance embodied in Project activities has been finalized:

- **Institutional strengthening and capacity building.** As mentioned in several sections of this Study, capacity building of farmers and strengthening of rural organizations (community or branch associations²⁵¹, cooperatives, etc.) will be an important objective of the Project. For this reason, diverse activities of this kind will be implemented. As a result of this effort, the project will build the capacity of family farmers, and their organizations, to assess, plan, adopt and use climate resilient agriculture and water management practices.
- **Locally adapted solutions.** The selection, development and dissemination of CRPS, which are viable and offer economic benefits, will be done in partnership with famers, thus assuring that these systems will be highly adapted to local environmental conditions and also the families' needs. At the same time, the investments made with local microenterprises that produce tools, equipment and other innovations for resilient climate production will be another factor that will ensure that local solutions are valued.
- **Assuring self-reliance through climate resilient productive systems (CRPS), locally adapted solutions that are cost-effective.** CRPS shifts the way family farmers manage soil and water resources in the post-project scenario. The project concentrates on technologies that are cost-effective and easily taught and applied.
- **Adapted tools and microenterprises to foster rural entrepreneurship.** The project will provide support to microenterprises to stimulate the development of tools, equipment and services geared towards CRPS to improve labor conditions in the field.
- **Multi-stakeholder Engagement²⁵².** The Project was designed and will be implemented with an active community, civil society, local and national government participation. This collective building helps ensure lasting impacts. Effectively managed partnerships with selected partners at international, national and local levels will enable the Project to: i) focus on partner's complementarities and comparative advantages; ii) strengthen its capacity to address agricultural issues effectively and efficiently; iii) leverage resources to scale up successful approaches.
- **Engagement of the National Development Bank.** BNDES is a strategic partner whose commitment and experiences will add value to all the Project cycle and maximize the achievement of the Project's goals. BNDES has national influence and a capacity to mobilize resources. It also will disseminate lessons learned to other bank programs and has the potential to include many more CRPS-type projects in its lending portfolio.
- **Influencing public policy.** Advocacy to improve access to markets and establish CRA markets will guarantee that sustainable gains are maintained beyond implementation.

²⁴⁹ BNDES's Social Fund is currently investing on family farming development programs in seven Northeast States and has already funded 24 thousand cisterns and 3.3 thousand social technologies for agroecological production in the region.

²⁵⁰ IFAD is currently implementing 6 projects supporting the productive structuring of family farming and water access social technologies, encompassing 11 states, 9 of which located in the Northeast region.

²⁵¹ Branch associations, such as goat breeders' or bee-keepers' associations.

²⁵² IFAD's Strategic Framework 2011-2015 includes effective partnerships and resource mobilization as one of eight principles of engagement. (IFAD. **An executive summary of IFAD's Strategic Framework 2011-2015**. Rome: IFAD 2011. Available at: https://www.ifad.org/documents/38714170/39132730/sf_summary_e.pdf/c76021bc-a3de-4563-adcf-eddfbb9a6e16).

- **Women and youth empowerment.** These groups' leadership is promoted transversally throughout most project activities. The network of young communicators, for example, engages youth to register, experiment, and build awareness of the CRPS practices. Women leadership will be fostered by developing the capacities of local women, enabling them to become 'knowledge managers'.
- **Knowledge building based on lessons learned from the Project's implementation process.** A monitoring and evaluation framework (M&E) system and data base-lines are designed in such a way that M&E can operate in real time, as from the beginning of Project implementation. Under Component III, the Project will systematize and disseminate the results of the implementation of CRPS, including economic analyses of the returns of these systems. This information will be disseminated widely to the farming community, but it will also be targeted towards decision makers and policy formulators, with the aim of stimulating commitments from different stakeholders, including government agencies that deal with resilient rural development. Dissemination will be done using a range of methods and platforms, such as capacity building sessions, learning and knowledge sharing events and workshops, as well as multiple media outlets. The exchange of lessons learned will foster development effectiveness and allows scaling up of the implementation of agroforestry systems in existing *Caatinga*.
- **Fostering South-South Cooperation.** The Project also engages in South-South Cooperation for sharing knowledge and lessons-learned with farmers of other developing countries living under similar climate stress.

The exit strategy relies on the success of the project itself to improve the livelihoods of project participants and to create an enabling environment at various levels that are supportive of climate resilient agricultural production.

6. MONITORING AND EVALUATION

6.1 General configuration of the Monitoring and Evaluation System

A Planning, Monitoring Evaluation and Learning System (PMEL) will be developed to allow the results-based project management. The data and information collected through the use of specific tools for the implementation of Climate Resilience Productive Systems (CRPS), will contribute not only to learning, feedback and improvement of project interventions but will also build the foundations for the material relevant to the knowledge management (KM). The PMEL will be a fundamental tool to the Central Project Management Unit (CPMU/BNDES) decision making and will be in particular useful to provide feedback to the Project Management Units (PMUs) at the state level. In addition, the systematization and dissemination of good practices and successful experiences will be important to define and design South-South cooperation schemes, advancing concrete results.

The Project Management and Accountability System (PMEL) of the activities and results will be executed at two levels (or by two instances): the first will be inserted in the central coordination team (PMEL-CPMU), and the other level that will make up the state project teams (PMEL-PMU). These two levels will be active parts in the planning and monitoring of the activities to be performed. PMEL activities will be undertaken by state-level projects, with information compiled by the central body to be established with the CPMU.

The PMEL-PMU teams should be in line with the State Secretariats involved assisting in the measurement of logical framework indicators, information regarding physical advances and results obtained. In this way, each PMEL-PMU will be able to monitor and coordinate the execution of all activities proposed for the Project in the respective State and strategically support the implementation of these actions. In addition to operational complementarity, these articulations will be vital to ensuring that the counterpart portion of the state is implemented in accordance with the proposed design.

The choice of each activity to be performed by the Project should be linked to an analytical and participatory process, involving all stakeholders, starting with the other professionals of the PMUs, state units, entities engaged in the provision of the TA service, collegiate bodies, municipal and territorial level, and the community and economic organizations with which the Program works. In this sense, the planning process will take place within the rural communities, land reform settlements and traditional communities in all municipalities that will be part of the Project. It will be up to each PMU to create mechanisms and procedures to integrate, at the local and regional level, the Project planning process with the other planning carried out by partner public and private entities in the municipalities covered by the Project.

The PMEL-CPMU team will be responsible for receiving and consolidating information from the state projects, and should, therefore, be articulated with the PMEL-PMU teams. Thus, it will be up to the CPMU to feed the Program's logical framework with the progress of the results, besides planning and conducting evaluative studies that encompass the main activities carried out in the field by the State Projects.

6.2 M&E activities and tools

6.2.1 Activities

The main PMEL activities are:

- i) monitoring of Logical Framework (LF) indicators;
- ii) supporting the preparation of the AOP with the responsible for components; constantly updating the M&E IT system (own and of IFAD Brazil);
- iii) supporting the teams responsible for the implementation of the Components in the preparation of the Technical Progress Reports;
- iv) managing the Impact Assessment Study (Baseline and Final Assessment);
- v) Elaborating quantitative records of interventions by thematic area;
- vi) conducting a participatory and qualitative assessment of results;
- vii) using Geographic Information System (GIS) for monitoring.
- viii) Monitoring Resilience and GHGs

Therefore, there will be an effort to integrate Project monitoring strategies. This will provide the creation of internal space for the technical teams for continuous reflection, based on the systematized information, on the progress and obstacles in the achievement of the indicators put, and provide the conditions to review the action strategies in the various stages of the implementation cycle.

Regarding the institutional arrangement, it should be emphasized that the specialists of Social Communication (SC) and Knowledge Management (KM) should work in line with the teams of M&E and those of gender, race and ethnicity. Thus, there will be the production of knowledge in an integrated manner, able to subsidize new actions, and also for the dissemination of the main results obtained.

The information generated by the M&E system, which will attest to the validity of experiences in the social and environmental field from the various proven impacts, will be used by the SC & KM team in the dissemination process, serving as inputs to influence public opinion and to influence the political sphere. In this way, the materials produced under the Projects will provide a solid basis for the scaling-up process, also assisting in the elaboration of legal frameworks and public policies aimed at the sustainable management of natural resources.

6.2.2 Tools

The main MRE tools of the Project - at the general level and also at the state level - are:

The **Logical Framework** integrates three levels of indicators: impact (based on results of Impact Assessment Studies), results and process (Project advances). The last two types are designed to evaluate the results of Project actions in the field and will serve as a basis for rethinking and realigning the planned strategies and activities. The M&E system is sensitive to gender and generation; thus, whenever possible, these data will be disaggregated.

Impact Assessment will be carried out by each State Project and composed of two phases:

- **Baseline Study (BS)**, which is a start-up phase database of families' conditions in the covered area at the beginning of the Project. It will consist of a sample survey involving treatment groups (beneficiaries), and a control group (not served by the Project). The survey questionnaire will follow the model IFAD applies for its Projects in Brazil, adapted to cover all the expected impacts of the Project. In order to elaborate the sample design of the baseline study, as this is particularly important for the accomplishment of the impact assessment study, the Project should consult with renowned institutions such as the International Policy Center for Inclusive Growth (IPC-IG), a United Nations body and IFAD's partner in developing sample designs and validation of baseline databases in Brazil.
- **Final Evaluation Study** is based on a household sample survey. It shall apply the same research questions, and impact indicators of the BS, covering the same treatment and control groups visited during the previous phase. This Study shall be done during the last year of project execution and will include families that have benefited from the Project for at least three years, as well as a control group.

Quantitative systematizations of interventions by thematic area shall be carried out, to inform the Project M&E unit of the most immediate impacts on households in terms of income and food security in short to medium term. These activities need to articulate with other Project components and to include specialists of different areas - Race, Ethnicity, Gender, and Youth. The results of the learning exchange visits will also be systematized and reported. At least 3 of these thematic systematizations will happen throughout the project execution period.

Participatory qualitative evaluation of results. The CPMU will implement a participatory monitoring methodology referring particularly to CRPSs results obtained in the field, with the participation of youth communicators. M&E data will be used to communicate Project's results to the media, governments and partners. Outcomes of exchanges and learning initiatives will also be published as part of the Project Knowledge and Results Management.

Technical Progress Reports (TPR). State Projects will submit TPRs each semester, with detailed descriptions activities by component and subcomponent. TPRs will inform to what extent implemented activities promoted progress in reaching the goals set in the Project design and Annual Operational Plan.

M&E using Geographic Information System (GIS). The Project will carry out monitoring activities using the Geographic Information Systems (GIS) methodology, with the objective of demonstrating the recovery of the intervention areas (areas of productive use (SAFs) and vegetation restoration areas). The adoption of this type of methodology will serve as an essential subsidy for the calculation of carbon sequestration.

To analyse the restoration of recovered areas, the following ecological indicators will be monitored: canopy and soil cover, regenerating density, and number of regenerating species. This analysis will extrapolate the limits of the intervention areas, evaluating the spillover effect of Project actions. Vegetation recovery will be monitored every three years and studies should be preferably performed during/after the rain season. These studies will be implemented in partnerships with expert institutes, such as GEO-BNDES, the National Institute of Space Research (INPE), MapBiomass, in addition to specific consultancies.

Monitoring of resilience: Monitoring of changes in the resilience capacities of farming families is a particular feature of the monitoring of the impacts of the project. Understanding and monitoring family/household resilience is complex. There are multiple factors, linked to socioeconomic and agroecological conditions, contributing to the families' capacities to cope with climate shocks and adapt to growing stress from slowly increasing temperatures and hotter and dryer conditions. Inspired by the [DFID KPI4 Methodology](#) adapted to the IFAD and GCF project type, a resilience scorecard and index have been developed tailored to the project's theory of change (reference appendix 1). This methodology has a pragmatic approach to deal with the multifactor complexity. It only focuses at monitoring the resilience capacities the project seeks to address or is likely to influence. It does not monitor absolute resilience but changes in resilience of the beneficiaries compared to the baseline or control group families. The resilience questionnaire and scorecard may be adjusted in consultation with project stakeholders at project start-up and will be completed as part of the baseline survey and at midterm and at the end of the project. As mentioned under point (3), it should be used for knowledge generation and improved analysis of resilience dynamics by combining it with the GIS-based monitoring studies of vegetation cover and ecological quality and climate data showing if stresses or extreme weather events have occurred during the implementation of the project.

Participative and qualitative evaluations of results: Participative monitoring will use indicators to analyze several aspects (in conjunction with the "youth communicators"). The team should use M&E data to prepare communication documents on the project's main results for the media, government, and partners, including the Forum of Secretaries of Family Agriculture of the Northeast and Minas Gerais. It is the responsibility of the consulting team to present -- in a simple, visual and comprehensive manner -- the progress made in the project's main activities and results, in both the monitoring and evaluation phases. This consulting team will use the progress reports as well as the M&E system inputs, results of the baseline study, thematic systematizations, and impact assessment study to draft and disseminate material summarizing and illustrating the project's main advances to a diverse audience, in both the public and private sectors. The consulting team will prepare and organize the photographic material to be used in the content disseminated to the government and partner entities. The project's knowledge management team will also be in charge of the dialogue and exchange of experiences with other BNDES and IFAD projects in Brazil. Publication and dissemination of communication material on results of exchanges and learning pathways with farmers and technical assistance teams from other IFAD and BNDES projects will also be part of the project's knowledge and results management.

Quantitative organization of interventions by thematic area: The project should quantitatively organize activities by thematic area (e.g., productive farms, sheep / goats, transformation of waste from productive activities into production inputs, etc.). This organizing will report on the most immediate impacts on each family's well-being in terms of income and food security in the short to medium term. At least five thematic organizing efforts should be undertaken during the project execution period. By their nature, these evaluations will be part of the Learning and Knowledge Management subsystem.

GHG tracking tool (annex 11A): will provide initial estimations on GHG reductions, for verification. The information required to complete the report will be streamlined into TRIPs and will be tracked at investment level. Each PMU will present to the CPMU semiannual reports tracking investments for evaluation.

6.3 Results Framework

Core indicator targets		
E.2.1. Expected tonnes of carbon dioxide equivalent (t CO ₂ eq) to be reduced or avoided (mitigation only)	Annual	550,140 t CO ₂ eq
	Lifetime	Between 11 086 999 tCO ₂ eq and 11 621 173 t CO ₂ eq
E.2.2. Estimated cost per t CO ₂ eq, defined as total investment cost / expected lifetime emission reductions (mitigation only)	(a) Total project financing	<u>202,500,755</u> USD
	(b) Requested GCF amount	<u>99,500,390</u> USD
	(c) Expected lifetime emission reductions	<u>11 M</u> t CO ₂ eq
	(d) Estimated cost per t CO ₂ eq (d = a / c)	<u>18</u> USD / t CO ₂ eq
	(e) Estimated GCF cost per t CO ₂ eq removed (e = b / c)	<u>2</u> USD / t CO ₂ eq
E.2.3. Expected volume of finance to be leveraged by the proposed Project as a result of the Fund's financing, disaggregated by public and private sources (mitigation only)	(f) Total finance leveraged	<u>103,000,365</u> USD
	(g) Public source co-financed	<u>103,000,365</u> USD
	(h) Private source finance leveraged	_____ Choose an item.
	(i) Total Leverage ratio (i = f / b)	<u>1.04</u>
	(j) Public source co-financing ratio (j = g / b)	<u>1.04</u>
	(k) Private source leverage ratio (k = h / b)	_____
E.2.4. Expected total number of direct and indirect beneficiaries, (disaggregated by sex)	Direct	1,000,000 40% of female
	Indirect	1,500,000 40% of female
E.2.5. Number of beneficiaries relative to total population (disaggregated by sex)	Direct	4.7 (Expressed as %) of NEB population
	Indirect	7 (Expressed as %) of NEB population

Fund-level impacts						
Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	A1.2 Number of males and females benefiting from the adoption of diversified, climate resilient livelihood options (including fisheries, agriculture, tourism, etc.)	Tracking of TRIPs investments, and resilience scorecard at baseline mid-term and completion.	0	Male 240,000 Female 160,000	Male 600,000 Female 400,000	4 people per family. Indicator will be disaggregated by gender and age. Target: 50% youth and 40% women.
	Percentage of women reporting improved empowerment index at project level	Project-level women's empowerment index (pro-WEAI) at	0	0	70%	

		<i>baseline and completion</i>				
<i>A2.0 Increased resilience of health and well-being, and food and water security</i>	<i>A2.2 Number of food secure households (in areas/periods at risk of climate change impacts)</i>	Resilience Model scorecard at baseline, mid-term and completion.	0	21,440	53,600	80% success rate of Output 2
	<i>Percentage of women, 15-49 years of age, who consume at least 5 out of 10 food groups (MDD-W) (IFAD CI 1.2.8)</i>	<i>Minimum Dietary Diversity-Women indicator at baseline and completion</i>	0	0	75%	At least 75% of people that participate in nutrition sensitive training and activities will improve diets.
	Rural households that report a reduction in the water shortfall in relation to the production requirements (IFAD CI 1.2.3)	Tracking of funded TRIPs, and completion study.	0	11,520	28,800	80% success rate of Component 2 (Output 5). Availability of water for production.
<i>A4.0 Improved resilience of ecosystems and ecosystem services</i>	<i>A4.1 Coverage/scale of ecosystems protected and strengthened in response to climate variability and change</i>	Studies of satellite imagery in areas with recovered vegetation. Mid-term and completion.	0	33,650 hectares	84,124 hectares	100% success rate of Output 3. Collective areas sustainable management.
<i>M4.0 Reduced emissions from land use, reforestation, reduced deforestation, and through sustainable forest management and conservation and enhancement of forest carbon stocks</i>	<i>M4.1 Tonnes of carbon dioxide equivalent (t CO2 eq) reduced or avoided (including increased removals) - forest and land use</i>	Tracking of funded TRIPs, and completion study.	0	0	11M tCO _{2e}	Carbon emission measurements will take place from midterm evaluation using GIS and ExAct measurement tool.

Project / programme performance indicators						
Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
Output 1. Territorial Resilience Investment Plans (TRIPs)	Baseline studies to profile families willing to receive investments from projects	Baseline report and implementation support / supervision missions.	0	–	3	1 study per state
	TRIPs developed	Tracking of funded TRIPs, and completion study.		230	575	2300 communities, 4 communities per plan
Output 2. Household Resilient Investment	Families benefited by CRPS (by sex and age; 40% women and 50% youth)	Tracking of PMEL ²⁵³ system, field sampling verification	0	Male 16,080 Female 10,720	Male 40,200 Female 26,800	Target considers male and female led households.
	People provided with climate information services (IFAD CI 3.1.2)	Tracking of PMEL system and supervision missions.	0	49,600	124,000	4 people per family
	Number of persons provided with targeted support to improve their nutrition (disaggregate per gender, age, indigenous peoples). (IFAD CI 1.1.8)	Tracking of PMEL system and supervision missions.	0	Male 34,560 Female 23,040	Male 86,400 Female 57,000	
Output 3. Collective Resilient Investment	Families benefited by collective areas CRPS	Tracking of PMEL system, field sampling verification	0	41,200	103,000	
Output 4. Farmers and Entrepreneurship support	People trained in production practices and/or technologies. (IFAD CI 1.1.4) (by sex and age; 40% women and 50% youth)	Tracking of PMEL system and supervision missions.	0	Male 5,760 Female 3,840	Male 14,400 Female 9,600	
	Fund for micro-enterprises to develop CRPS suppliers	PMEL Team tracking of investments, and supervision missions.	0	28	70	
Output 5. Water access technologies for harvesting, reuse, treatment and storage	Families benefited by rainwater harvest and storage	Tracking of PMEL system and supervision missions.	0	8,400	21,000	
	Number of hectares of farmland with water-related infrastructure built/rehabilitated (IFAD CI 1.1.2)	Tracking of PMEL system and supervision missions.	0	1,800 hectares	4,500 hectares	

²⁵³ Project Planning, Monitoring Evaluation and Learning System (PMEL)

	Families benefited by treatment and reuse of grey and black waters.	Tracking of PMEL system and supervision missions.	0	6,000	15,000	
Output 6. Capacity and awareness building	Women, youth and traditional communities build capacity	Inputs from PMU Gender, Youth and Ethnicity team, tracking of PMEL system and supervisions missions	0	3,600	9,000	
	Young communicators using social communication tools to register and systematize activities developed in communities.	Inputs from PMU Gender, Youth and Ethnicity team, tracking of PMEL system and supervisions missions	0	166	414	
Output 7. Scaling-up and sharing	Number of learning routes (national and international), thematic studies and policy dialogue working groups	Tracking of PMEL system and supervision missions.	0	3 learning routs; 3 thematic studies; 3 working group	7 learning routs; 8 thematic studies 3 working groups	
Output 8. Planning, Knowledge Management and M&E	Seminars promoted and documents elaborated support knowledge diffusion (i.e. studies, systematizations and knowledge management).	Tracking of PMEL system and supervision missions.	0	30	75	
Output 9. Effective Management	Financial / physical execution of the AWPB surpasses 75% each.	Tracking of PMEL system, financial reports, and supervision missions.	0	-	>75%	

The full Results Management Framework is available in APPENDIX IV of this Feasibility Study.

7. PROJECT MANAGEMENT AND IMPLEMENTATION

7.1 Implementation Arrangements

The institutional arrangements aim, simultaneously, at providing cohesion for the project and guaranteeing operational independence for the participating States. They result from consultations with relevant national authorities, including the National Designated Authority (NDA) in the Ministry of Economy (ME), Ministry of Citizenship (MC), Ministry of Regional Development (MRD) as well as the Executing Entity, BNDES. In addition, there was ample consultation with state governments and local stakeholders, including civil society. BNDES will represent the GoB in the loan agreement with IFAD.

The Central Project Management Unit (CPMU) will be placed within BNDES and will monitor implementation, compile physical and financial information, and organize the scheduling, reporting and accountability to IFAD. Each State will establish its own state-level Project Management Unit (PMU), which will be responsible for procurement, finance and disbursement, evaluation and monitoring of its own activities. Each State will implement its Subsidiary Financing Agreement with BNDES, and comply with IFAD policies on Procurement and Contracts, Financial Management, Audit, Monitoring, Eligibility and Fight Against Fraud and Corruption, as well as requirements defined by BNDES in its co-financing policy. The Subsidiary Financing Agreement will mirror the loan and grant arrangements of the Project's overall financing package project and will be subject to IFAD'S prior to no objection.

Whenever possible, States will build upon the pre-existing operational structure of IFAD-supported Projects. The PMUs will be based within the state Secretariats responsible for family farming. The TORs and selection of PMU's key team members will be submitted to IFAD for review and no-objection. The selection of support consultants will take place through an open and competitive process, with a prior review by IFAD and BNDES.

Both CPMU and PMUs will establish a multi-stakeholder committee for guidance. For the CPMU, it will be an Advisory Committee with the participation of the NDA and appointed representatives from federal agencies and ministries, to guarantee the project efficiency, integration with other programs and policies, and achievement of expected results. The State-level PMUs will establish Management Councils to ensure the accomplishment of objectives, transparency and equity, which will, following the practice of the on-going IFAD-supported projects, include the participation of beneficiaries and civil society representatives (including indigenous peoples) in addition to representatives from State-level Secretariats.

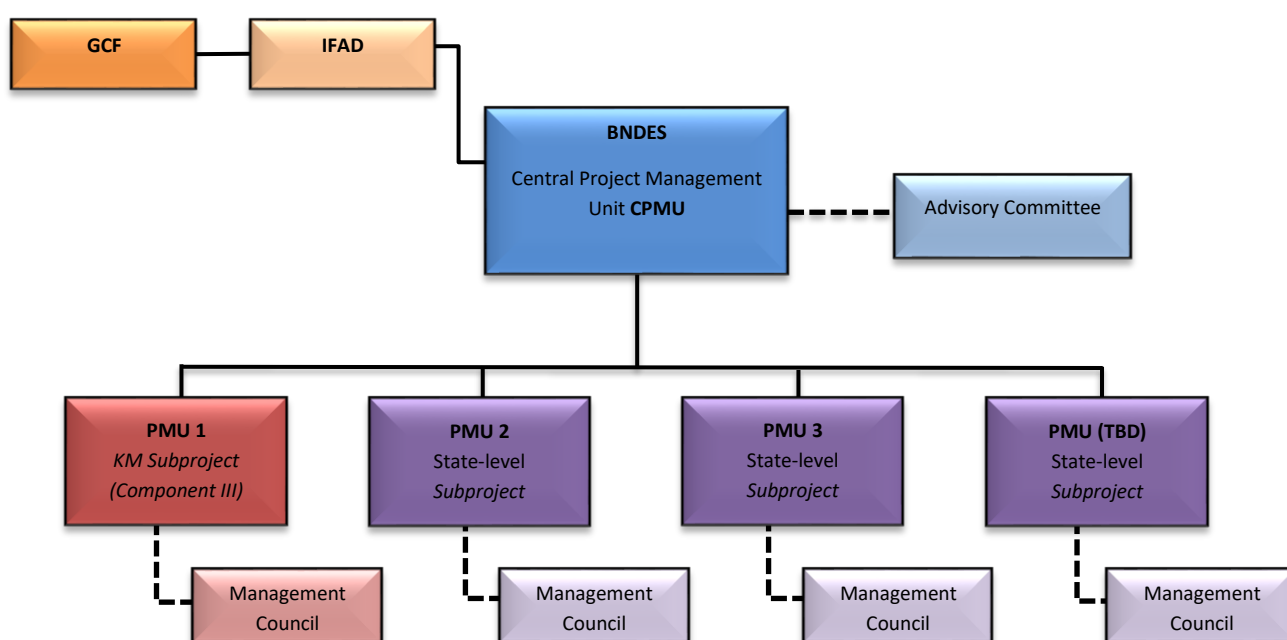


Figure 37 Project management structure

Table 13 Institutional governance

ARRANGEMENT	COMPOSITION	RESPONSIBILITIES
IFAD	IFAD team headed by Country Director	<ul style="list-style-type: none"> • Produces the GCF's Annual Performance Reports (Appendix 5) on the basis of the progress reports received from BNDES; • Carries out the supervision (includes the findings of the field supervision missions), mid-term, implementation support and final review missions, and reports as necessary; • Reports to the GCF; • Conducts prior reviews and issues no-objections.
Central Project Management Unit (CPMU)	BNDES team headed by Project Coordinator	<ul style="list-style-type: none"> • Executes the overall project and coordinates subproject implementation in line with the PIM; • Oversees, guides and evaluates project execution; • Approves the sub-projects' AWPBs; • Guides the PMUs on subproject implementation, including AWPBs, operational issues and reporting; • Submits AWPBs, including procurement plans, and physical and financial progress reports for the overall project to IFAD; • Performs financial management, accounting, engages auditors and submits audit reports to IFAD, relative to the activities of the overall Project; • Submits Withdrawal Applications to IFAD; • Requests IFAD no-objections; • Proposes changes to the project design based on implementation experience and external circumstances (including the project's logical framework and the PIM).
Project Management Units (PMUs) (subproject level)	Subproject teams headed by Subproject Manager	<ul style="list-style-type: none"> • Execute the subprojects in line with the PIM; • Follow CPMU guidance on project execution; • Perform financial management, procurement and contract management; and provide full access to and collaboration with the project auditors; • Submit Withdrawal Applications to BNDES; • Submit requests for no-objections to BNDES, for passing on to IFAD; • Ensure procurement is compatible with the Project's social and environmental safeguards; • Submits AWPBs, including procurement plans, and physical and financial progress reports for the subprojects to BNDES; • Ensure that contractors are familiar with GCF, IFAD and BNDES policies, norms and procedures to: (i) avoid ineligible expenditure and delays in projects implementation; (ii) protect the assets of the project; • Develop TOR and cost estimates, technical specifications and budgets; • Conduct analysis of quotations, technical and financial proposals; • Prepare price calculation maps, reports of portfolio, technical and financial evaluation; and • Manages respective contracts provided for procurement and contracting plan.
Advisory Committee	Representatives from the federal government, civil society, participating states, BNDES	<ul style="list-style-type: none"> • Advises on general direction of project execution; and • Promotes integration and alignment with other government projects, programs and policies.
Management Councils	Representatives of State Administration, beneficiaries and civil society	<ul style="list-style-type: none"> • Review the subproject's AWPB. • Assess activities and procedures of the PMU; • Review technical-administrative, economic-financial and operational information related to PMUs; and • Integrates and aligns with other state projects, programs and actions • Evaluate and approve TRIPs

7.2 Flow of Funds and Disbursement

IFAD, the fiduciary agent of the GCF loan and grant funds, will operate under the IFAD General Conditions for Agricultural Development Financing and its Disbursement, Financial Reporting and Audit Manuals, in addition to BNDES regulations for financing public State entities.

GCF and IFAD funds will be deposited in US dollars in a designated account maintained by the GoB, represented by BNDES. BNDES will channel the Project funds to the final beneficiaries. Resources expenditure will be guided by the approved Annual Operational Plans and implementation progress.

IFAD/GCF funds may (i) reimburse the payments of eligible expenditures incurred by BNDES or (ii) anticipate up to 9 months of the planned eligible expenditures in the disbursement schedule. In both cases, BNDES will present an application form and supporting documentation, in the form and substance satisfactory to IFAD.

Further details and disbursement procedures will be included in the Letter to the Borrower (LTB), which will be prepared by IFAD and sent to the Borrower upon signature of the Financing Agreement. The procedures and disbursement requirements will also be addressed in the LTB.

For States, BNDES may advance payment of part of the resources and make successive releases through the presentation of proof of expenditures, following its institutional financing procedures and the Financial Procedures Manual adopted by the Project.

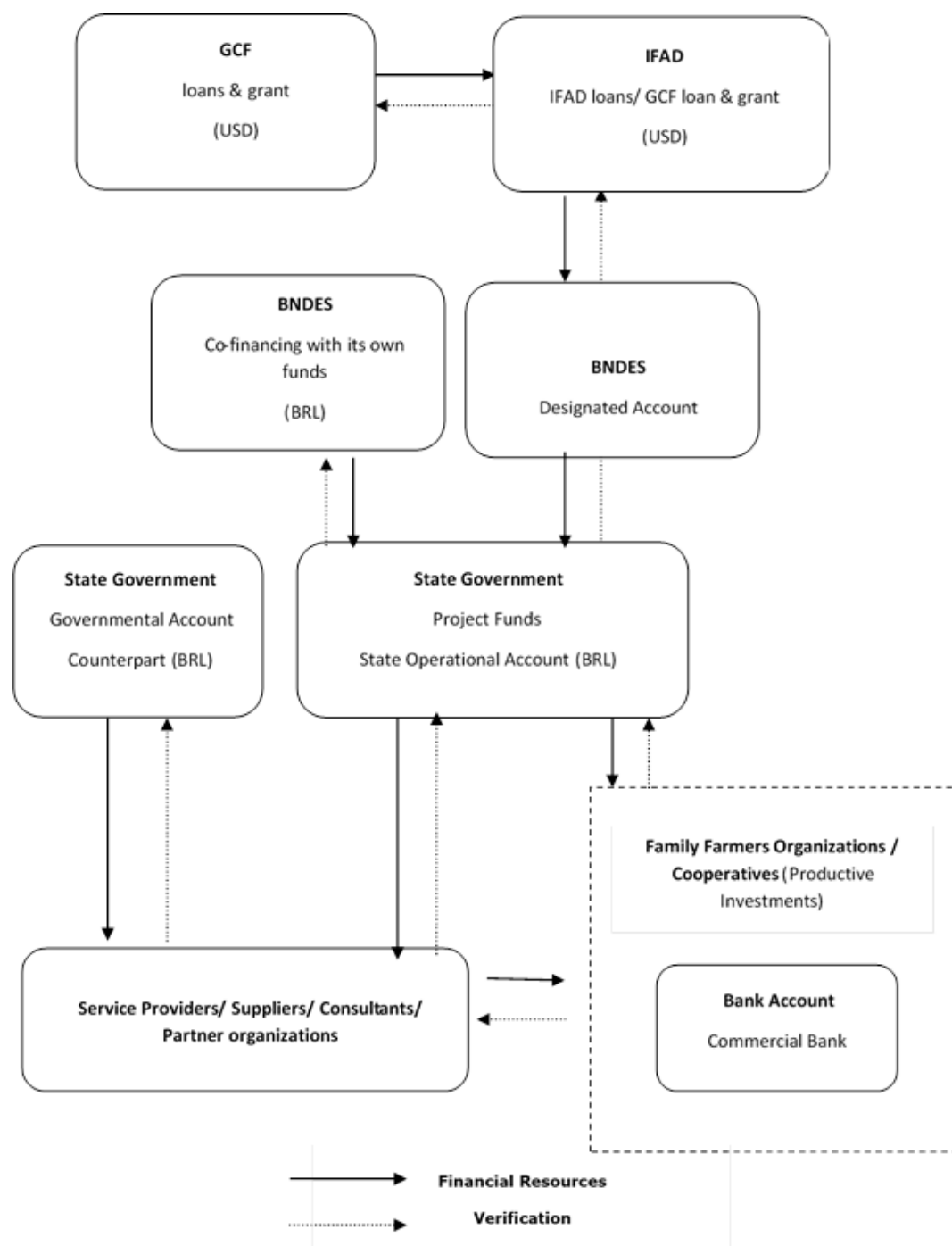


Figure 40 Funds Flow Chart

The financial supervision of the Project will be carried out directly by IFAD for the overall project and in each State, independently of other national control and oversight bodies, and will consist of evaluating the implementation of financial management and performance risks and mechanisms, identifying corrective actions and monitoring fiduciary risks. Supervision will be carried out on desk through periodic financial and audit reports *in loco* in each State and will include: (i) evaluation of financial statements; (ii) evaluation of the auditors' reports and follow-up of any questions raised by the auditors in their letter of recommendations; (iii) participation in on-site supervision of the Project (including visits to States).

There will be a midterm review of the Project that will evaluate: (i) progress in relation to the achievement of results in the field and the disbursement schedule; (ii) the effectiveness of the institutional arrangements and financial management; (iii) the Financial Procedures Manual, suggesting revisions and updates; (iv) the results of execution and Financial Management of the States; and (v) the achievement of AWPBs.

In an on-desk role, IFAD will carry out prior reviews of the first bidding process for each of the planned methods in each State and of those that exceed the resource margin stipulated in the Procurement Plan. During supervisory, support and mid-term review missions, IFAD will analyze, through sampling, the subsequent tenders. The annual audits should consider mainly for analysis, sampling of biddings processes not verified by IFAD in its missions to have a greater scope of execution verification. All IFAD reviews, as well as the audits, should be guided by the IFAD Procurement Policy and the fight against fraud and corruption.

To ensure the Executing Entity (BNDES) has sufficiently strong financial management systems and controls to manage, monitor and report the Project's finances adequately to guarantee resources are used in an economical and efficient manner for the intended purpose, in line with IFAD's Financial Management Assessment Guidelines, IFAD conducted a Financial Management Assessment (FMA) at BNDES, particularly with the Financial Division and the Public Management and Sustainability Division, which will be responsible for the coordination of the Project. The Federal Government will guarantee this financing.

Regarding risks related to States, BNDES will use the expertise for credit evaluation considering the state payment and implementation capacity. BNDES will seek the Federal Government's guarantee for the entire Project operation.

7.3 Financial Management and Procurement

7.3.1 Financial management

GCF resources will be under IFAD's fiduciary responsibility, and the agency will follow its technical, financial and monitoring standards. BNDES will have the role of Central Project Management Unit (CPMU), carrying out the Project's financial management with a qualified team of public servants and acting with a global fiduciary responsibility to execute the financial arrangements established in IFAD Guidelines.

Internal Control will be ensured by the segregation of duties, reconciliation of accounts and expenses approval by experts. The Handbook of Financial Procedures, detailing guidelines for disbursements, payments, approvals, commitments, and reporting, will orient CPMU and PMU staff. All Project budget and accounting transactions will be carried out in the Accounting Management System (AMS) of each entity. All project costs are accounted for in accordance with the Annual Work Plan and Budget (AWPB).

Accounting: BNDES uses its own financial management system for the planning, execution and follow-up of projects and activities. This system will provide information for monitoring the Annual Work Plan and Budget (AWPB), the use of resources, project accounts, counterpart contributions, contracts and agreements by categories of expenditures, project components and sources. The Project will use IFAD's Client Portal-ICP to send requests for withdrawals, accountability and monitoring of Project's financial information.

Financial Reports: Both the CPMU and the PMUs will generate financial information, identifying sources of funds and expenses by budget line, categories and components. The CPMU will periodically send interim financial reports (IFR), and Annual Financial Statements to IFAD. PMUs will report to BNDES, subsidizing the CPMU in the consolidation of information submitted to IFAD.

Internal and External Audit: The Project will be audited annually by independent external auditors in accordance with International Standards on Auditing (NIAs) and INTOSAI. Reports shall be submitted to IFAD within 6 months after the end of the fiscal year. PMUs will also have their project accounts audited annually, the report of which shall be provided to the CPMU to support the auditing of the whole Project.

7.3.2 Procurement management

Procurement management will be carried out through the PMUs with the support of experts in bidding, hiring, and accountability. State Project teams should have the technical capacity to prepare and manage contracts, as well as support the formalization, execution, and closure of agreements with beneficiaries

In all Procurement and Contracting Plans (PCP) activities, PMUs should use IFAD and BNDES Guidelines. Bidding can be awarded to a partner institution, mainly for the recruitment of staff, after analyzing its institutional capacity to follow IFAD and BNDES Bidding Guidelines, contractual arrangements and policy on fraud and corruption.

To ensure an efficient execution, IFAD will conduct an analysis of the installed capacity of each Project. IFAD will keep track of team selection to ensure that the workforce is adequate; review the preparation of each Project Implementation Manual (PIM); oversee the elaboration of Handbooks and Booklets for bidding commissions to ensure proper project execution; supervise procurement and contract management. IFAD will also provide training to improve teams' capacity at the start of implementation and when necessary.

PMUs shall be responsible for the safekeeping and provide instruction on procurement processes and ensure that beneficiaries do so and make them available for future audits or IFAD and BNDES supervision. This also applies in cases where there is a partner institution supporting project implementation.

8. CONCLUDING REMARKS

As stated earlier, in the Brazilian semiarid region, the present situation and future prospects of the rural population, as well as of the *Caatinga* biome itself, are quite gloomy.

The livelihoods of family farmers are already severely stressed due to the historical degradation of the ecological and productive functions of backcountry agroecosystems, a process resulting from several factors. Among them, we will mention their vulnerability to climate variability and the increasing demographic and productive pressure on the resource base available to these families. In this context of increasing pressure on resources (vegetation, soil, genetic resources, water), many of the newly introduced innovations aimed at intensifying production have had a negative effect on sustainability, increasing resource depletion.

This process will be severely aggravated by the regional effects of climate change - such as increased rainfall variability with a significant downward trend, more frequent and severe droughts, and rising temperatures - with a possible collapse of production systems. This situation can lead to a substantial worsening of environmental degradation, as well as a situation of water and food insecurity and an acute crisis in the livelihoods of the population living in this region.

However, against this background, several initiatives have begun to be tested and implemented in recent years. They signal it is possible to reverse this scenario, seeking to favor adaptation to climate change. It is worth mentioning, on the one hand, the emergence of some public policies - even if they are still insufficient - that have an explicit concern with the resilience and sustainability of the population and environment of the semiarid region began to be implemented. We will mention as an example the minimum income programs, access to water, and the Rural Environmental Registry.

On the other hand, since the beginning of the 21st century, there is a growing concern with the redesign of production systems. There has been a growing conviction that these systems need to be profoundly renewed to enable the rural population to obtain their livelihoods while preserving the ecosystem. A transformation of production systems in a sense pointed out here is crucial to promote adaptation to ongoing climate change.

In the present study, several technical proposals, which fit the perspective of change indicated in the previous paragraph, were presented and evaluated. This evaluation indicates a valuable collection of sustainable practices that should feed the much-needed process of redesigning the backcountry production systems. In the analysis made, it was shown that these proposals have a considerable potential to increase and mainly to "stabilize" production in the face of the growing stress that climate change is causing. At the same time, these proposals, virtually by definition, seek to preserve and, where necessary, restore existing environmental resources. Thus, new production systems should allow better management of water and soils, preserve/restore native vegetation, and conserve local genetic resources.

Although this collection may still be enriched with new proposals, the main conclusion of this study is that the current challenge is to spread the use of these proposals much more widely, so that in the coming years a considerable area is being managed through Climate Resilient Productive Systems (CRPS).

This challenge is the central axis that should guide the performance of this project. Therefore, the present study also presents, in detail, the Planting Resilience Project, seen as a powerful instrument to be placed at the service of the much-needed changes outlined above. The examination of the axis indicates that this action should be entirely feasible.

On the other hand, while some public policies should be considered as initiatives that have a positive impact on resilience, it must be recognized that active policies for the dissemination of resilient production systems are very scarce today. In this context, the Project's intervention format - which will provide investment support and technical assistance - characterizes an innovative form of public action that, if successful, will represent a model to be used for designing public policies to support semiarid resilience in the future.

Project: Planting Resilience in Rural Communities of the Brazilian Semiarid

Feasibility Study

APPENDIXES

Project: Planting Resilience in Rural Communities of the Brazilian Semiarid

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APPENDIX I

Principles and Practices for Design and Implementation of Climate Resilient Productive Systems (CRPS) in Semiarid Northeast Brazil

➤ Introduction

FAO²⁵⁴ (based on IPCC²⁵⁵) classified technologies and practices that improve farmer's climate resiliency in improved agronomic practices, integrated nutrient management, tillage and residue management, water management, and agroforestry. These practices are often grouped and referred to as Climate Resilient Agriculture, or Climate-Smart Agriculture, and can consist of several methods, arrangements, and technologies. What is climate-resilient to one biome or a production system may not be applicable to another. Climate challenges are also varied in any given geography, and adaptation solutions depend on the size of the area and resources available to the farmer. Thus, IFAD hired a team of expert consultants including agronomists, environmental scientists, an anthropologist and a farmer; who spent three weeks in the field consulting several farmers, NGOs, technical assistance teams as well as universities and research institutions; to respond to the following question: what is climate resilient agriculture for family farmers in the Brazilian semiarid?

➤ Six guiding principles for Resilient Systems in Semiarid Northeast Brazil

The Project will encourage family farmers to apply principles and practices of resilient production to set up two integrated and interdependent agricultural subsystems ensuring productivity during the twelve months of the year: one specialized dry subsystem (only depending on the rainy season for water) and another specialized year-round production that makes use of specific water sources and storage particularly during the long dry season. In the semiarid region, IFAD found out that the concept of resilient climate production translates into practices that will increase availability, flow and retention of water in the system. Pragmatically, it means the simultaneous implementation of the following practices and principles, which shall define what Climate Resilient Productive Systems (CRPS) are:

- (i) Soil Preparation: Maintenance of dispersed trees, setting up cradles and natural fertilization;
- (ii) Soil Protection: Soil cover and biomass production with resilient plant varieties;
- (iii) Water management: capture and storage (both in soil and vegetation), contour lines or curves and terraces;
- (iv) Planting practices: seeking to enhance stratification, diversification and densification with herbaceous, shrub and tree species maximizing the photosynthetic capacity of the plot;
- (v) Management of cultivated vegetation: active pruning and thinning;
- (vi) Sustainable animal husbandry: pasture rotation and fences.

²⁵⁴ BRANCA, G. et al. **Climate-Smart Agriculture: A Synthesis of Empirical Evidence of Food Security and Mitigation Benefits from Improved Cropland Management**. Rome: FAO, 2011. 35 p.

²⁵⁵ IPCC. **Climate Change 2007: Mitigation of Climate Change. Working Group III contribution to the Fourth Assessment Report of the IPCC**. Cambridge, United Kingdom and New York, NY, USA Cambridge University Press, 2007.

While most practices to be supported (see Table A below) have the potential to yield sustainable land management benefits and increase production, they require a significant change in farmers' practices and quite substantial investments. GCF support will enable farmers to take a longer-term perspective in anticipation of the significant financial, economic and livelihood benefits achievable through the application of adaptation measures relative to the declines in production and income that are expected to result from the effects of climate change.

GCF support responds to the urgency which climate change projections give to the application of these practices, and recognizes that for them to function effectively as adaptation measures, they must be applied as part of a larger-scale program and be directed and adjusted considering the needs, priorities and cultural specificities, both regional and at the local levels, of productive units.

These practices are interlinked, and their benefits are synergic, which means they must be implemented together. Assembling an agricultural system with these elements makes it a water producer, not a consumer, which is the correct approach for a region with low water availability. Table A below presents the adaptation benefits that each principle provides to the family farmer.

Table A. Principles and Practices of Climate Resilient Agriculture in the Semiarid

Practices / Adaptation Benefits	Retain soil moisture	Recharge soil moisture	Increase organic matter in soil	Increase photosynthesis	Increase soil carbon	Capture water	Capture humidity in air	Improve microclimate	Reduce erosion
(i) Soil Preparation: Maintenance of dispersed trees, micro-valleys and natural fertilization	X		X	X				X	X
(ii) Soil Protection: Soil cover and biomass production with resilient plant varieties	X		X		X	X	X		X
(iii) Water retention: level curves and terraces		X				X			X
(iv) Planting: Stratification, diversification and densification			X	X		X		X	X
(v) Management: Active pruning and thinning;				X				X	
(vi) Grazing: Pasture rotation and fences.			X	X	X				X

(i) Soil Preparation

The first step in soil preparation is to eliminate the slash and burn as a method of land clearing. Studies show it is inappropriate for agricultural production in the semiarid because it continuously degrades soil and biodiversity of the *Caatinga*.²⁵⁶ Land clearing for pastures and plantations will be performed by selecting, pruning and maintaining dispersed trees. Maintaining or even increasing the number of dispersed trees in the pastures in the dry tropics that endure prolonged dry periods represents an option to increase the productivity, profitability and sustainability of animal husbandry systems.^{257 258} The removed biomass from the land clearing will serve as soil cover, as explained in part (ii).

Soil preparation activities must be carried out during the dry period, well before the first rainfall, so the plants and animals can take advantage of all the water for their development, avoiding delays and the compromising of results. Cradles for planting seedlings or seeds should be opened, reserving the top soil to put back into the cradle at the time of planting. They must be rich in nutrients to allow the plants to have enough food to grow. The use of natural fertilization will be encouraged, be it the fertilizer of ruminants or the biomass produced by the system as well as phosphate and, if possible, rock dust. Fertilization is not a simple provision of nutrients to the plant. It has the function of activating the soil's biological activity and involves the cycle of water and minerals. If plantation lines are contemplated, they should be concave in their longitudinal axis to accommodate the natural humidity of the environment and favor the development of the plantation, creating a micro-valley where the root of the plant is located.²⁵⁹

²⁵⁶ MAMEDE, M.; ARAÚJO, F. Effects of slash and burn practices on a soil seed bank of *Caatinga* vegetation in Northeastern Brazil. *Journal of Arid Environments*, n. 72, p. 458 - 470, 2008.

²⁵⁷ ARAÚJO FILHO, J. A. *Manejo pastoril sustentável da caatinga*. Recife, PE: Projeto Dom Helder Camara, 2013. 200 p.

²⁵⁸ LASCO, R. D.; DELFINO, R. J. P.; ESPALDON, M. L. O. Agroforestry systems: helping smallholders adapt to climate risks while mitigating climate change. *Wiley Interdisciplinary Reviews: Climate Change*, v. 5, n. 6, p. 825 - 833, 2014.

²⁵⁹ SOUSA, H.; MATOS ALMEIDA, S. R. *Jardinagem Florestal: Criando e manejando Agroflorestas de alimentos*. SI: Edição do Autor, 2016.

(ii) Soil Protection

The soil is a living organism and, thus, needs feeding. Biomass, or organic matter, is the vital food of the soil, especially in the tropical climate, where nutrient cycling is vigorous, and the decomposition of organic matter is quick. A malnourished plant under stress of any origin, increases respiration, reduces photosynthesis, and consequently accumulates fewer carbohydrates, water and produces smaller harvests. A compacted soil with little macrobiotic life prevents roots from obtaining nutrients and water. Therefore, to meet the needs of the plant, the farmer must protect the soil from the sun, wind, and rain, in addition to nourishing the fauna. Healthier plants result in photosynthetic efficiency that ensures better yields. This gain is so significant that if there is availability at low cost, family farmers will be encouraged to bringing biomass from outside sources to cover the soil.

In order to grow biomass, a plantation matrix must be constructed with specialized species that photosynthesize during the long dry season, which is natural in the dynamic of the *Caatinga*. This means combining plants into a system that is capable of producing biomass and accumulating water all year long, including under the stress of climate-induced droughts. This matrix should consist of *cacti*, *euphorbiaceae*, *spondias* and *agaveaceae*.

If possible, at the beginning of implementation, farmers will produce forage for animals and food for human consumption. However, the biomass withdrawn from the system should be the smallest part (1/3), leaving most of it (2/3) to feed the system itself. These fractions will reverse as the soil becomes more fertile and the system healthier.

(iii) Water management

Water can be considered the main limiting factor for agriculture and animal husbandry in the *Caatinga* zone. Nevertheless, the water debate should be focused not on its absence but on how to preserve water during the rainy season so that it can be used during the rest of the year.

It is fundamental to understand that the most important water reserve must be the soil itself. This can be accomplished by reconstructing the natural infiltration promoted by the forest systems that have been depleted. To build a Climate Resilient Agricultural System in degraded and compacted areas, such as the ones often found in the Semiarid region, it is necessary to plant in terraces and along contour lines, as well as installing artificial systems for capture, storage and infiltration of rainwater, such as ditches, reservoirs and microbasins, to eliminate runoff and promote forced recharge, and thus improve soil hydration.²⁶⁰

Component 2 details multiple water harvesting techniques which are being widely used in the region. It is crucial, nevertheless, to implement these technologies as a means to shift the culture of production in the *Caatinga* towards climate resiliency. Performed with the current agricultural practices, these technologies will only increase the dependency on external water and fertilization resources, as soils will continue to degrade and compact. Yet, with the development of the Climate Resilient Productive Systems proposed here, the infiltration can occur naturally making more springs perennial and promoting a biological water reserve in the roots and leaves of specialized vegetation (species such as forage cactuses, *mandacaru*, deer papaya, *umbú*, sisal, *piteira*, aloe).

(iv) Planting practices: stratification, diversification and densification

Stratified, diversified and densified cropping patterns increase the photosynthetic capacity of land, and therefore, the volume of biomass produced per cultivated area, improving water circulation and promoting an improvement in the microclimate²⁶¹.

The competition among plants takes place in the strata and not for water or nutrients. Plants of different strata harmonize because they have different light requirements. Crops of the lower layer produce in the shade, those

²⁶⁰ BRANCA, G., et al. **Climate-smart agriculture: a synthesis of empirical evidence of food security and mitigation benefits from improved cropland management**. Rome: FAO, 2011.35 p.

²⁶¹ LASCO, R. D.; DELFINO, R. J. P.; ESPALDON, M. L. O. Agroforestry systems: helping smallholders adapt to climate risks while mitigating climate change. **Wiley Interdisciplinary Reviews: Climate Change**, v. 5, n. 6, p. 825 - 833, 2014.

of the middle stratum need a little more luminosity, and so on, up to those of the emergent stratum that require full light. A system with photosynthetic efficiency associates plants belonging to different strata, that do not compete with each other.

According to Sousa^{Error! Bookmark not defined.}, the strata and their respective occupancy rates can be:

- Ground stratum, plants can occupy 10 to 20% of the horizontal space
- Low stratum, plants can occupy 80 to 90% of the horizontal space
- Medium stratum, plants can occupy 50 to 60% of the horizontal space
- High stratum, plants can occupy 20 to 40% of the horizontal space
- Emergent stratum, plants can occupy 10 to 25% of the horizontal space

Whereas in a monoculture, the potential photosynthesis can reach up to 100% in any given area, in stratified plantations, it can vary from 160% to 235%. Considering that the sun is the only source of energy, this energy needs to be harnessed to the highest intensity. Thus, maximum plant cover is necessary. The horizontal density that complements the stratification uses both commercial and non-commercial species, the latter to be used to generate biomass that will be incorporated into the system.²⁶²

Several studies suggest that stratified systems may be more resilient to extreme climatic conditions than annual crops and tree-crop monocultures, as they have several mechanisms to reduce the impact of droughts, such as buffering of humidity, reduction of air and soil temperature extremes, windbreaks and shelter belts to slow wind speed and minimize water loss from evapotranspiration.^{263,264}

The diversification and stratification must increase in time as the system progresses. First, the project will promote tested consortium models that can both improve the production conditions as well as stimulate discussions on new agricultural practices and combinations between the species the farmer is already familiar with. As the system becomes more productive, the diversity and quantity of products will increase and, in return, the system will produce water instead of consuming it.

(v) Management of cultivated vegetation: active pruning and thinning

Pruning, thinning and removal of the senile individuals, to open more space to restart the planting process under more evolved conditions is crucial to the success of the system. Short-cycle crops (herbaceous and shrubs) inter-cropped with tree species (timber and fruit) should be planned, so that after a few years of agricultural production, the trees may be cut to form a new clearing, thus restarting a new production cycle. As the productive environment improves permanently, increasing production and productivity, there is no need for the farmer to leave the plot and clear new land.²⁶⁵

Natural pruning - caused by wind, lightning, insects - is used by Nature to 'organize' natural forest systems. The function of pruning is the input of organic waste and the rejuvenation of the species and the system. In cultivated systems, pruning can serve several general purposes simultaneously: ensure structure in the stratum of the system; production of biomass to protect and feed soil; production of stakes and stems for planting or fences; forage production; or for marketing such as firewood, stakes, etc. Pruning can also be carried out with more specific objectives, as is the case of the pruning of food species to boost production and of timber species to produce a better stem.

Swidden agriculture is an ancestral technique; to a certain extent, it is the indigenous agriculture or itinerant cultivation, which, after abandoning the area, relies on Nature for the recovery of soil fertility, through the regeneration of the natural vegetation. Planned and practiced on the basis of the principles of forest management, CRP Systems are a model of food production that guarantees recovery, improvement and

²⁶² SOUSA, H.; MATOS ALMEIDA, S. R. **Jardinagem Florestal: Criando e manejando Agroflorestas de alimentos**. SI: Edição do Autor, 2016.

²⁶³ BRANCA, G., et al. **Climate-smart agriculture: a synthesis of empirical evidence of food security and mitigation benefits from improved cropland management**. Rome: FAO, 2011.35 p.

²⁶⁴ MICCOLIS, A. et al. **Restauração Ecológica com Sistemas Agroflorestais: como conciliar conservação com produção. Opções para Cerrado e Caatinga**. Brasília: Instituto Sociedade, População e Natureza – ISPN/Centro Internacional de Pesquisa Agroflorestal – ICRAF, 2016. 266 p.

²⁶⁵ SOUSA, H.; MATOS ALMEIDA, S. R. **Jardinagem Florestal: Criando e manejando Agroflorestas de alimentos**. SI: Edição do Autor, 2016.

conservation of the soil, production of clean, sweet and crystalline water, abundance of healthy foods, and food security and sovereignty for the farming family.

It is important to reinforce that with this kind of active management; the whole system sprouts vigorously, generating more biomass production. When this practice is done correctly, and at the appropriate time, the system becomes resistant to drought periods and acquires resilience for good use of the rainy season.

(vi) Sustainable animal husbandry: pasture rotation and fences

Animal husbandry, especially goats and sheep, is the main activity of the family farmer beneficiaries of this Project. Many authors have shown that stratified systems with trees can provide benefits for this activity²⁶⁶. Trees can be an essential source of shade and shelter to animals improving productivity by reducing heat stress in tropical climates. In addition, some tree species produce leaves and pods which are highly palatable to these animals and are available during the dry season when pastures are of a low nutritional quality. Native trees of the *Caatinga* (such as *faveleira* or *carnaúba*) improve weight gain and milk production.²⁶⁷ However, grazing and forage management need to be adapted so as to increase resilience to climate change.

Areas with a low grazing pressure show a higher diversity of plant species than areas with higher grazing intensity. To implement the climate resilient production systems, it is necessary to reduce free-roaming livestock, fodder storage and pasture rotation²⁶⁸.

Forage will be grown with the system described above.²⁶⁹ Especially in the first few years, nevertheless, animals should not interfere in the system, thus making fences necessary. The installation of live fence that requires no maintenance or renovation will be encouraged. These live fences/trees can be part of the system and fulfill several other functions such as wind-breaking, biomass production; fruits and fodder production and also serve as shelter for the animals.

➤ **Diversity of Climate Resilient Models**

In addition to the adaptation benefits laid out above, the practices prosed in this project have the potential to reduce atmospheric carbon by storing it in the aboveground biomass of trees, in soil organic carbon and, indirectly, by reducing pressure for forest clearance.

In the Brazilian semiarid, it should be noted that there are several concrete models that apply the practices and principles of CRPS cited in Table A. For instance, during one of the preparatory field missions, IFAD team had the opportunity to learn about the ‘syntrophic’²⁷⁰ model from a farming family in the municipality of Riachão do Jacuípe. This system is characterized by being extremely diversified, managed with pruning and densification, and for having as its main productive activities: goat rearing (milk and meat), vegetables and fruits. Another case observed during the project's design mission was the agroforestry model of forage production, which is based on the planting of forage cactuses and various other forage tree species.

There are records in the literature of CRPSs developed by Embrapa Goats and Sheep Research Centre, located in Sobral. This model is characterized by the management of *Caatinga* areas with thinning, ‘lowering’²⁷¹ and enrichment techniques. This kind of system has already been successfully implemented in land reform

²⁶⁶ ESQUIVEL MIMENZA, H. *Tree resources in traditional silvopastoral systems and their impact on productivity and nutritive value of pastures in the dry tropics of Costa Rica*. 2007. (MSc). CATIE, Turrialba, Costa Rica.

²⁶⁷ ARAÚJO FILHO, J. A. *Manejo pastoril sustentável da caatinga*. Recife, PE: Projeto Dom Helder Camara, 2013. 200 p.

²⁶⁸ SCHULZ, K. et al. Grazing, forest density, and carbon storage: towards a more sustainable land use in Caatinga dry forests of Brazil. *Regional Environmental Change*, v. 18, n. 7, p. 1969 – 1981, 2018.

²⁶⁹ MICCOLIS, A. et al. *Restauração Ecológica com Sistemas Agroflorestais: como conciliar conservação com produção. Opções para Cerrado e Caatinga*. Brasília: Instituto Sociedade, População e Natureza – ISPN/Centro Internacional de Pesquisa Agorflorestal – ICRAF, 2016. 266 p.

²⁷⁰ Syntropic’ Agriculture is a term referring to a na agroforestry farming system (AFS) based on the concept of syntropy (contrary to entropy) characterized by the organization, integration, equilibrium and preservation of energy in the environment (MONTE, A. L. *Sintropia em agroecossistemas: subsídios para uma análise bioeconômica*. 2013. 112 p. (MSc). Mestrado Profissional em Desenvolvimento Sustentável, Universidade de Brasília, Brasília.).

²⁷¹ This means pruning the higher branches of trees so as to induce sprouting that is easy to reach for the grazing animals.

settlements located in Rio Grande do Norte²⁷², as a result of the work of the IFAD-funded Projeto Dom Helder Câmara. It is also worth mentioning the *recaatingamento* model, which is designed for the recovery of degraded areas and is being used in the region that is known as the Sertão do São Francisco da Bahia Territory²⁷³.

Mentioning these examples, we want to point out, on the one hand, that there are already some proposals of CRPS being implemented by family farmers with positive results. Although these examples follow the same general principles, the diversity (of size, crops, arrangement) is as a key element to deal with the different situations that characterize the reality of the target region. On the other hand, these examples also indicate that such initiatives are few and far between, not yet reaching a larger scale.

²⁷² SIDERSKY, P.; JALFIM, F.; RUFINO, E. Combate à pobreza rural e sustentabilidade no semi-árido nordestino: a experiência do Projeto Dom Helder Câmara. **Agriculturas: experiências em agroecologia**, v. 5, n. 4, p. 23 - 28, 2008.

²⁷³ Retrieved at: <http://www.recaatingamento.org.br/>

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APPENDIX II

Technical Assistance services for beneficiaries of Productive Resilience Investments

The Technical Assistance (TA)²⁷⁴ is considered an essential tool for the Program to achieve desired results. Recognizing that families in poverty and extreme poverty have the least access to scarce TA services and are those who need this support the most, the advice provided by the Project will play a major role in driving actions to be developed with the families and organizations with which it will work. In the broadest sense, the Program TA will have as its primary function to develop, among the beneficiary population, the necessary capacities for the success of the initiatives supported by the Program.

In the case of this Project, the Technical Advisory Service system will seek to incorporate the input of experienced farmers into specially identified climate resilient production practices. Often in development projects, technical assistance providers play a central role in teaching farmers what to do, instructing them on methods and techniques. However, it turns out that extension service providers are usually not practitioners and are not closely related to their advisors in the communities. The strategy for this Project postulates, contrary to conventional approaches,

The incorporation of 'farmer instructors' into the Program's Technical Assistance activities

Often extension services and communities (i.e. producer organizations or local authorities) select advisers / 'farmer instructors' together. A common procedure is for extension services to meet the criteria of community representatives, who then use the criteria to select 'farmer instructors'. Criteria may vary, including, for instance, good reputation, interest, and ability to share information, be implementing climate-resilient agrosilvopastoral systems (and therefore mastering Climate Change Resilient Productive Practices - CRRPP) and being a full-time resident in the community.

The contribution of these 'farmer instructors' can take many forms. In certain cases, they may be able to receive groups of visitors to learn about the resilient systems that they are implementing. In others, 'farmer instructor' may be incorporated into TA teams.

that technical advice should be a participatory process in which beneficiaries are involved in technology generation and dissemination. Farmers have local ties and continually interact with beneficiaries along the production value chain. Farmers who are 'from the community' are more sensitive to local crops, mannerisms, farming practices and family farmers' needs. Thus, the Program will seek to integrate some 'farmer-instructors' to contribute to its effort to disseminate resilient agrosilvopastoral systems in the Semi-arid.

Nevertheless, these 'farmer-instructors' need strong support from extension services. TA approach must shift the conventional technology transfer model, in which communication is one-way (from the extension team to farmers), to the reorientation toward a participatory model. Thus, 'farmer-instructors' will usually serve as a complement to existing extension systems rather than substitutes. In this model, farmers will be protagonists,

²⁷⁴ In this document the concept of Technical Assistance (TA) or Technical Assistance Services (TAS) should be understood in a broad sense, which includes the various advisory services necessary for the development of families, communities and rural population organizations. In the international literature, this broad interpretation of TA services has been termed 'Rural Advisory Services' or 'Rural Advisory Services - RAS'. (ADOLF, B. **Rural Advisory Services Worldwide**. Lindau, Switzerland: GFRAS. Available at <http://www.g-fras.org/en/knowledge/gfras-publications/file/6-rural-advisory-services-worldwide%202011> ; and SULAIMAN, R.; BLUM, M. L. **Tailoring rural advisory services for family farms**. Rome: FAO and GFRAS, 2016. 65 p.)

knowledge bearers, while extension technicians should play a facilitating role in promoting farmer networks and exchanges.

- TA desirable attributes.

In accordance with the national policy - PNATER - the TA to be provided by the Program should have a set of attributes, which will need to contribute to its better performance with beneficiary families. Firstly, TA teams should have a regular presence in the communities and proximity with families. It should also be multipurpose in terms of the issues worked on, covering technical, market access, organizational strengthening and other topics. In terms of work methodology, TA should have a participatory stance that seeks to enhance the knowledge of all involved. It will also seek to “adopt the principles of agroecology as the guiding axis of actions”²⁷⁵. It will need to work to strengthen gender equity and youth participation as well.

The primary mandate of TA Services provided by the Program to both Components I and II beneficiaries will be to support the transformation of backyard agroecosystems through the establishment of agroforestry systems and other resilience practices. To this end, it should develop the necessary capacities to ensure the successful implementation of CRPS and all innovations supported by the Project. TA should also support community organization and market access.

The action of TA teams will have the above methodological roadmap as their primary guide. At the same time, it will adopt working methods that allow the activities to be carried out with the public served (including those related to productive investments) to be identified, designed, planned, implemented and evaluated in a participatory manner, with the active participation of key stakeholders.

- TA tools

There are several 'classic' tools that have been used by rural extension for a long time, such as training courses and events, technical lectures, field days, leaflets and booklets, movies and photos, etc. They will undoubtedly play a role in implementing a rural program advisory proposal²⁷⁶. But the Project will encourage the use of less usual tools, which privilege, whenever possible, 'farmer to farmer' contact. These tools include exchange visits, experimentation and joint efforts²⁷⁷.

- *Exchange visits*

Improving crop and rearing performance, or harnessing potential often requires fresh ideas and information. Knowledge exchanges can be a way of meeting these needs for information and education.

Exchange visits involve organizing a group of farmers to visit another farmer or another group (community, settlement, association, etc.). In this type of initiative, peers are the main source of information, ideas, etc.. At the same time, although a group or family that is 'more advanced' on a particular subject is usually paid a visit, usually the visitor also discusses and comments what is being observed. Thus, this initiative is a real 'exchange', not a 'one-way' process. Due to the proximity of language and the life situation, often the exchange visit (between farmers) have more effect than courses or lectures given by technicians on the same subject. For example, if a settlement is having health problems in milk production, it is often more interesting to arrange a visit to a group of farmers who have managed to overcome this problem, rather than calling a researcher to talk about the issue.

It is imperative that the purpose of the exchange is clear to all those involved. The visiting group needs to consider visitors needs and what they want to know. A second point for 'visitors' is the choice of people to attend the exchange, as there are usually more applicants than vacancies. Once the group has been defined, it

²⁷⁵ BRASIL et al. **Política Nacional de Assistência Técnica e Extensão Rural**. Brasília: MDA/SAF/DATER, 2004.

²⁷⁶ There are many publications that deal with these tools. In Ruas et al. and in Coelho you can find information on several of these tools. (COELHO, F. M. G. **A arte das orientações técnicas no campo: concepções e métodos**. Viçosa: Editora da UFV, 2005. 139 p.; e RUAS, E. D.; AL., E. **Metodologia participativa de extensão rural para o desenvolvimento sustentável - MEXPAR**. Belo Horizonte: EMATER-MG, 2006. 134 p.)

²⁷⁷ INCRA. **Referenciais metodológicos para o Programa de ATES**. Brasília, DF: INCRA / MDA, 2010. 120 p. Available at: http://www.incra.gov.br/portal/arquivos/projetos_programas/port_01_dd_ates.pdf

is useful to have a preparatory meeting with them to better organize the observation, determine what will be taken, and also organize the logistics (timetable, snacks, etc.).

Although exchange events are premised as spaces for peer communication, this does not mean that visitors need to be quiet all the time. Sometimes a question about an aspect that has been overlooked, which has been poorly explained, can be critical. At other times technical input or questioning may be necessary.

- *Experimentation*

Experimentation can be an excellent resource for organizing rural advisory action in the form of participatory development of solutions to chosen issues. It is important to remember here that experimentation, understood here as testing new ideas, is something that has been present in the peasant environment for a long time in various parts of the world, including the Brazilian semi-arid. As a teaching tool, experimentation of this kind means putting into practice innovation and monitoring its development over a period of time. Often, the performance of the innovative practice is compared with that of an equivalent conventional practice. In this context, TA Services agents should always remember that the experimentation we are discussing here is primarily a **learning instrument**.

- *Mutirão*

It is common throughout Brazil the practice of forming groups (which usually gathers neighbors and relatives) who perform various types of work (agricultural, housing construction, etc.) without remuneration, for the benefit of one person or family. Although the beneficiary does not 'pay' for this work, it is usually up to him to 'welcome' his 'guests', for example, with a good meal. Since joint efforts work on the principle of reciprocity, those who receive the support of a group must somehow "return" the "favor" received.

There are rural advisory experiences that have taken advantage of this traditional social practice, making it a very interesting reflection and training event. It is a matter of giving the 'task force' an explicit didactic character. For instance, in a settlement in the southern region of the country, families are installing grape cultivation and learning the different techniques needed to succeed with this initiative. One of these techniques is the annual pruning of the vine. As most vine growers do not master this practice, the settlement technician organizes a joint effort in the plot of one of the families that have vines to prune. Either he or some farmer who has mastered the technique will be in charge of guiding the participants in the task force on how pruning should be performed. They will prune the host's vineyard, always under the supervision of the instructor(s). It is expected that, by the end of the event, participants have mastered the technique. At the same time, the group will have done an excellent job on the host plot.

- About TA teams

The teams will be sized according to the number of families to be served (approximately one technician for up to 150 families) and activities to be implemented so that they can dedicate themselves exclusively to the care of this public. Beneficiary families are expected to be served for 36 months for Component I activities. For Component 2, there will be 24 months of assistance.

Teams will consist of extension agents of various types. These generalist technical teams with experience in agroecological / agroforestry rural extension will integrate the teams. At the same time, they will have a person who specializes in management issues, who will be responsible for monitoring procurement, accountability, and other enforcement issues. Finally, these TA teams should incorporate some people from their own communities, whether they are 'farmer-instructor' (as discussed in the 'Incorporating' farmer-instructor 'text box into the Program Technical Advisory activities' above), or young children from farming families who have been educated at the Agricultural Family Schools (EFAs).

At the same time, the Program will seek to strengthen contracted TA teams with capacity building activities so that they can improve the quality of services provided to Project beneficiaries, especially in relation to SPRMC.

TA teams should work in line with the 'Young Communicators' program as part of a Knowledge Management work of component 3.

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APPENDIX III

Production model details (ref. chapter 5)

Table A. Main characteristics / assumptions for Component I models.

Aspects / Models	Agroforestry on rain-fed land for forage Production 1	Agroforestry on rain-fed land for forage Production 2	Agroforestry diversification of <i>Opuntia</i> monoculture plots 1	Agroforestry diversification of <i>Opuntia</i> monoculture plots 2
Main activity	Goats and sheep breeding	Poultry	Goats and sheep breeding	Dairy production / Cows breeding
Area	5-10 ha total area /0.5 ha Agroforestry Proposal	1-5 ha total area /0.5 ha Agroforestry Proposal	10-25 ha total area /0.5 ha Agroforestry Proposal	25-50 ha total area /0.5-1 ha Agroforestry Proposal
Current and Foreseen Crops / Production	Goats and Sheep (current) Licuri, Umbú, Passion Fruit, Cajú, Sisal, Palma Capim, Sorgho, Milheto, Painço, Feijao, Andu (foreseen)	Chicken and eggs (current) Licuri, Umbú, Cajú, Sisal, Palma Capim, Sorgho, Milheto, Painço, Feijao, Andu (foreseen)	Goats and Sheep / <i>Opuntia</i> (current) Licuri, Umbú, Cajú, Sisal, Palma Capim, Sorgho, Milheto, Painço, Feijao, Andu (foreseen)	Milk / <i>Opuntia</i> (current) Licuri, Umbú, Cajú, Sisal, Palma Capim, Sorgho, Milheto, Painço, Feijao, Andu (foreseen)
Strategy	Biomass production / Stratification / Densification / Diversification		Biomass production / Stratification / Densification / Diversification	
Quantities	Same 45 animals sold per year. 20/30 fruit trees with 20-30 fruits per year each Additional Forage production: 56 t	Same 6500 eggs and 93 chicken sold per year. 20/30 fruit trees with 20-30 fruits per year each Additional Forage production and sales: 14 t	Same 45 animals sold per year. 20/30 fruit trees with 20-30 fruits per year each Additional Forage production: 18 t	Same 129.000 l sold per year. 20/30 fruit trees with 20-30 fruits per year each Additional Forage production: 24 t
Labour per Yr	95 days / Family labour	140 days / Family labour	125 days / Family labour	95 days / Family labour 3 rural workers (2 permanent)
Self-Consumption	5-25%	25-40%	5-25%	5-10%
Financing	- Own savings and gains	Own savings and gains	Own savings / Agroamigo / BdB	Credit / BdN / BdB
Forage Demand / year	57 tons	17 tons (supply)	57 tons	82 tons

Main Investments	Fencing, seeds, plants, tools and equipment, land preparation, technical assistance (3 years)	Fencing, seeds, plants, tools and equipment, land preparation, technical assistance (3 years)	Seeds, plants, tools and equipment, land preparation, technical assistance (3 years)	Technical Assistance (2 years)
Without Project situation	Overgrazing, low commercial perspective.	No diversification	Overgrazing, low commercial perspective.	Overgrazing, low commercial perspective.
Income generated/year	From R\$ 3.600 to R\$ 3.800	From R\$ 4.000 to R\$ 4.600	From R\$ 757 to R\$ 3.200	From R\$ 40.000 to R\$ 45.000

Table B. Main characteristics / assumptions on Component I, models 4 and 5.

Aspects / Models	Micro-enterprise Machinery	Bee-keeping
Main activity	Commerce / Entrepreneurs	Honey production
Participants	Youths- 3 people group	18 people
Current and Foreseen Crops / Production	Adapted Pieces	Honey, bee wax.
Proposal	Buy and adapt equipment for Agroforestry for family farming	Income generation activity
Quantities	24 pieces per year	360 kg per farmer
Labour per Yr	3 full-time wages / 12 months	36 days / Family labour
Financing	Credit	Project Funding
Main Investments	Revolving fund to start the activity	Hives, inputs, tools and equipment
Without Project (WOP) situation	Even if the real alternative is unemployment, additional benefits are compared to a WOP situation where the farmer is having some incomes sporadically for the equivalent time in labor days required for the proposal	Natural Resources exploitation and overgrazing
Incomes generated per year	From R\$ 15.000 to 21.000	From R\$ 3.000 to R\$ 4.000

Table C. Main characteristics/assumptions for Component II models

Aspects/Models	Fruit trees and Vegetable beds irrigated with Gray Water Reuse equipment (1.a)	Fruit trees and Vegetable beds irrigated with Cisterns and Micro-dams (1.b and 1.c)
Area / Irrigated	0.25 ha / 1250 sq meters irrigated	0.5 ha / 3750 sq meters irrigated
Current and Foreseen Crops	Vegetables: Lettuce, Onions, Cabbage, Coriander, Beet, among others (foreseen). Fruits: <i>Umbú</i> , Citrus, Manga (foreseen).	
Impact proposition	Access to water for production and agroforestry conversion.	
Quantities	Lettuce: 1 bed 10sqm / 3 cycles/yr, Onions: 2 beds 10sqm / 2 cycles/yr, Cabbage: 1 bed 1sqm / 1 cycle/yr Coriander: 2 beds 10sqm / 2 cycles/yr Beet: 1 bed 10 sqm / 3 cycles/yr Citrus: 10 trees from 3 to 50 fruits per year each Manga: 10 trees from 3 to 50 fruits per year each Umbú: 10 trees from 5 to 20 fruits per year each	Lettuce: 3 beds 10sqm / 3 cycles/yr, Onions: 6 beds 10sqm / 2 cycles/yr, Cabbage: 3 beds 1sqm / 1 cycle/yr Coriander: 6 beds 10sqm / 2 cycles/yr Beet: 3 beds 10 sqm / 3 cycles/yr Citrus: 30 trees from 3 to 50 fruits per year each Manga: 30 trees from 3 to 50 fruits per year each Umbú: 30 trees from 5 to 20 fruits per year each
Labour per Yr	24 days/family labour	72 days/family labour
Self-Consumption	50-80%	30-60%
Financing	Project support and own savings	
Post-harvest Losses	10%	
Main Investments	Seeds and plants, access to water infrastructure, 2-year technical assistance, tools and equipment.	
WOP situation	Even if the real alternative is unemployment, additional benefits are compared to a WOP situation where the farmer is having some incomes sporadically for the equivalent time in labor days required for the proposal.	
Incomes generated	Approximately from R\$1500 to R\$ 3500 depending on the self-consumption rate.	

Table D – Income impact Indicators per Model

ITEM	Unit	Models								
		Model 1a- Veg. Beds and Fruit trees 1- Grey Water Reuse	Model 1b- Veg. Beds and Fruit trees 2- Other Water infrastructure	Model 1c- Veg. Beds and Fruit trees 3- Cisterns	Model 2a- Forage production and Agroforestry diversification in native lands 1	Model 2b- Forage production and Agroforestry diversification in native lands 2	Model 3a- Forage production and Agroforestry diversification in palm monoculture lands 1	Model 3b- Forage production and Agroforestry diversification in palm monoculture lands 2	Model 4- Micro-entrepreneur Business development	Model 5- Bee-keeping
<i>Without Project</i>		*	**	***	***		**	***		
<i>Incomes without project / Equivalent labour</i>	\$R/yr	724	2,171	2,171	1,376	1,847	4,176	63,563	34,452	1,080
<i>With Project</i>										
<i>Family income</i>	\$R/yr	6,358	7,606	9,194	7,154	8,706	9,919	74,093	78,038	4,927
<i>% increase</i>	%	779	250	323	420	371	138	17	127	356
<i>% impact / poverty line</i>	%	25%	24%	31%	26%	31%	26%	47%	194%	17%
<i>International Poverty line- World Bank (5,5 USD per day / family)</i>	\$R/yr	\$22,484								
<i>% impact / Average income per house-hold</i>	%	18%	17%	22%	18.32%	22%	17%	22%	138%	12.20%
<i>Average income per household Brazil</i>	\$R/yr	\$31,542								
<i>% Impact / International Poverty line</i>	%	28%	27%	34%	28.27%	34%	27%	34%	213%	18.82%
<i>International Poverty line (5USD per day / family)</i>	\$R/yr	\$20,440								
<i>60% Minimum Salary</i>	\$R/yr	\$13,493								
<i>Impacts in HH Income (%)</i>	%	42%	40%	52%	43%	51%	43%	78%	323%	29%
<i>75% Minimum Salary</i>	\$R/yr	\$16,866								
<i>Impacts in HH Income (%)</i>	%	33%	32%	42%	34%	41%	34%	62%	258%	23%
<i>50% Minimum Salary</i>	\$R/yr	\$11,244								
<i>Impacts in HH Income (%)</i>	%	50%	48%	62%	51%	61%	51%	94%	388%	34%
<i>Minimum Salary (2 person HH)</i>	\$R/yr	\$22,488								
<i>Impacts in HH Income (%)</i>	%	25%	24%	31%	26%	30%	26%	47%	194%	17%

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APPENDIX IV

State short profiles

BAHIA

Precipitation

The average annual rainfall is approximately 550 mm / year decreasing by 91.70 mm since 1981. For the period 1981 – 2019, December has been the rainiest month on average with 92.74 mm while September presents the lowest average rainfall at 11.40 mm. Rainfall patterns are erratic with deviations ranging from -74.59 to 179.63mm.

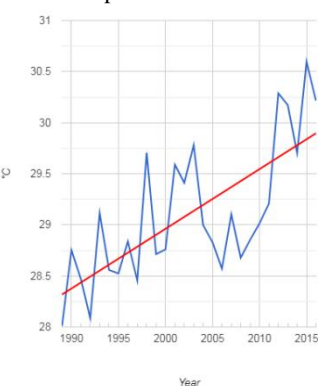
Temperatures

The average annual minimum temperature is 20.15°C, while the maximum temperature is 29.90°C. For the period 1981 – 2016 October presents the highest average temperature at 30.59°C, while August was the lowest at 17.48°C; minimum and maximum temperature have increased by 0.87°C and 1.58°C respectively.

Land Productivity Dynamics

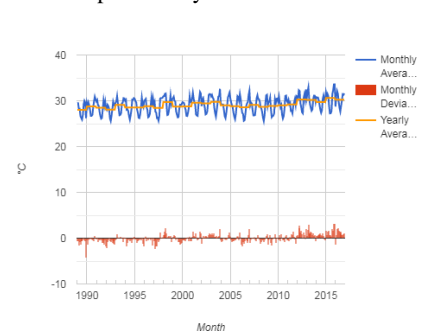
Caatinga portion of Semiard Bahia has 72% of land with declining productivity, an additional 20% present early signs of decline or are stable but stressed. Similar patterns apply throughout B.

Max Temperature 1989 – 2016



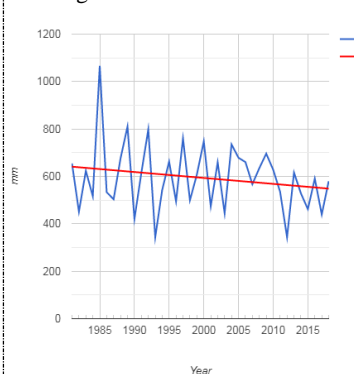
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2016



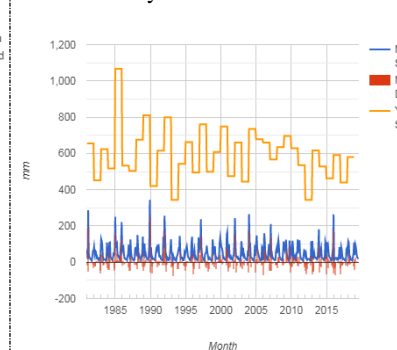
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



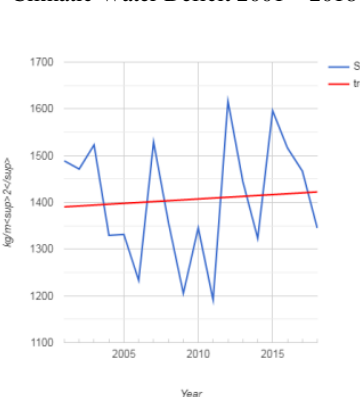
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



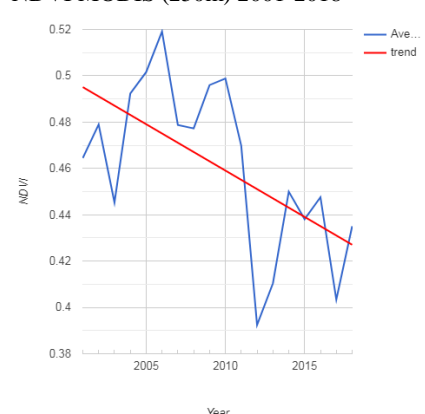
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



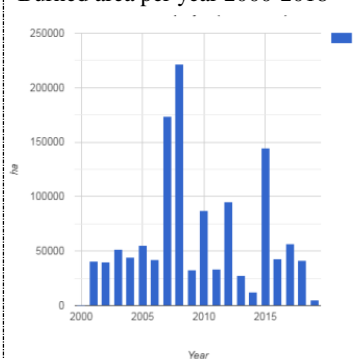
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



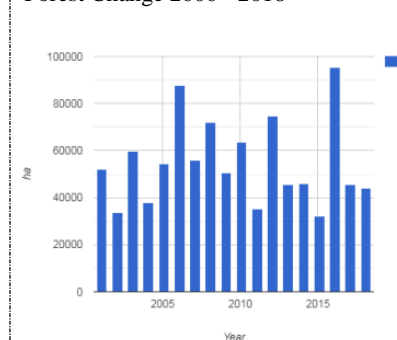
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018²⁷⁸

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and wildfire; and mildly to highly vulnerable to water scarcity and extreme heat.²⁷⁹ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

²⁷⁸ Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

²⁷⁹ Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

PIAUI

Precipitation

The average annual rainfall is approximately 760 mm / year decreasing by 66.31 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 182.25 mm while August presents the lowest average rainfall at 2.12 mm. Rainfall patterns are erratic with deviations ranging from -105.94 to 263.85 mm.

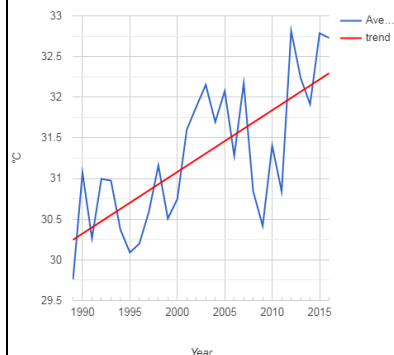
Temperatures

The average annual minimum temperature is 22.81°C, while the maximum temperature is 32.29°C. For the period 1981 – 2016 October presents the highest average temperature at 34.17°C, while July was the lowest at 20.85°C; minimum and maximum temperature have increased by 1.20°C and 2.05°C respectively.

Land Productivity Dynamics

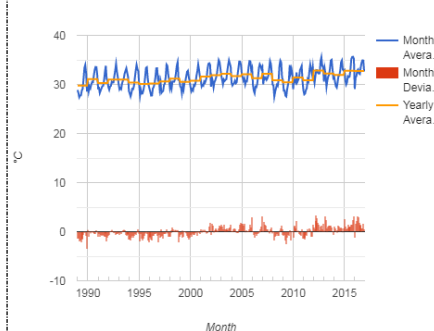
Caatinga portion of Semiard Piaui has 81% of land with declining productivity, an additional 13.5% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



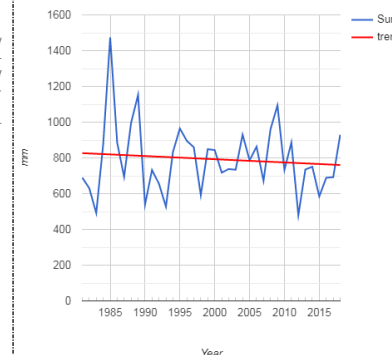
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2016



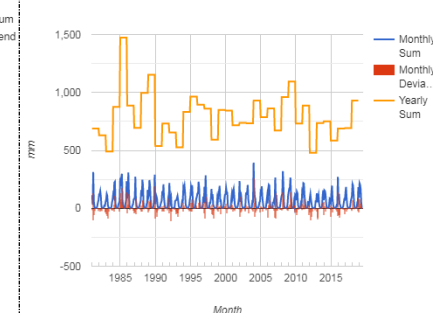
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



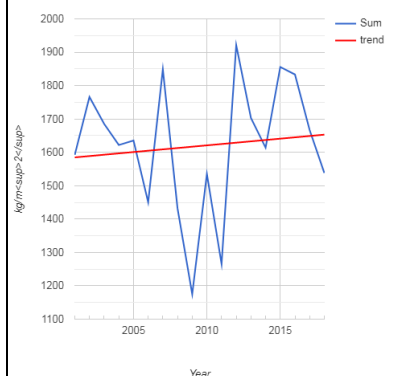
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



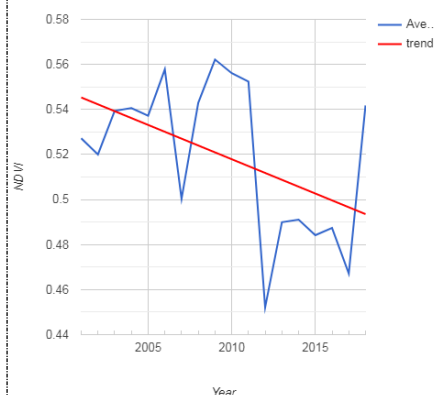
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



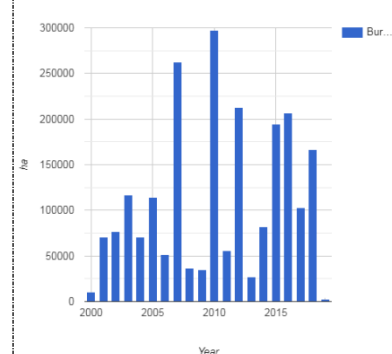
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



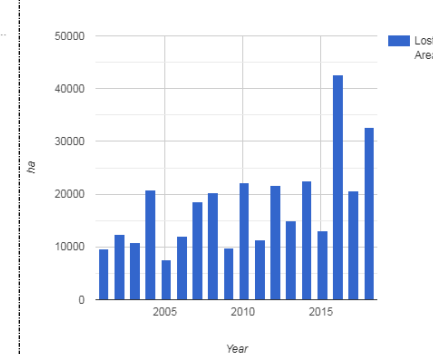
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018²⁸⁰

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and loss of tree cover and wildfire (particularly high risk for the Serra das Confusoes national park); and medium to high vulnerability to water scarcity and extreme heat.²⁸¹ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

²⁸⁰ Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

²⁸¹ Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

CEARA

Precipitation

The average annual rainfall is approximately 735 mm / year decreasing by 85.90 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 200.92 mm while September presents the lowest average rainfall at 3.47 mm. Rainfall patterns are erratic with deviations ranging from -117.33 to 261.48 mm.

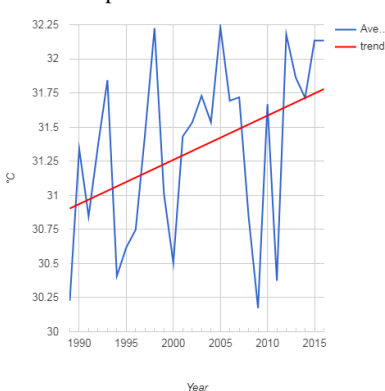
Temperatures

The average annual minimum temperature is 22.37°C, while the maximum temperature is 31.78°C. For the period 1981 – 2016 November presents the highest average temperature at 33.72°C, while July was the lowest at 21.20°C; minimum and maximum temperature have increased by 0.59°C and 0.88°C respectively.

Land Productivity Dynamics

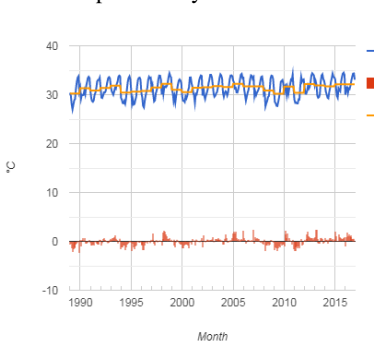
Caatinga portion of Semiard Ceara has 71% of land with declining productivity, an additional 14.5% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



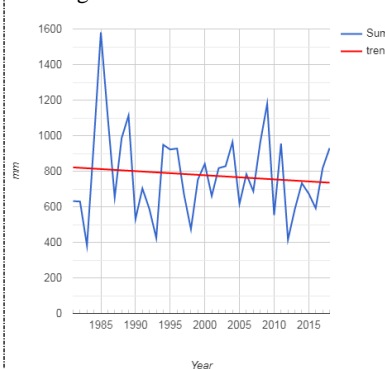
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2016



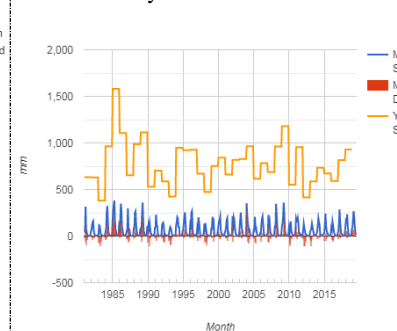
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



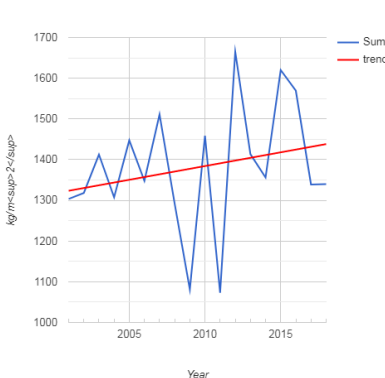
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



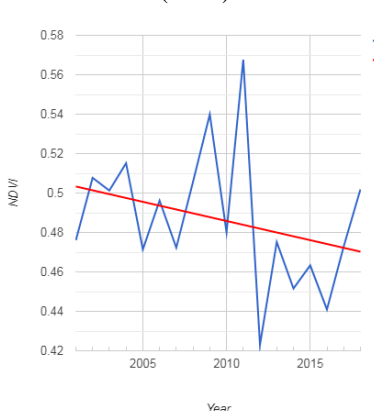
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



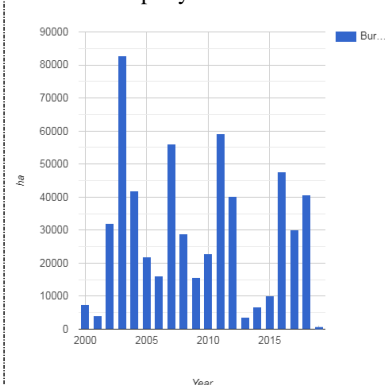
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



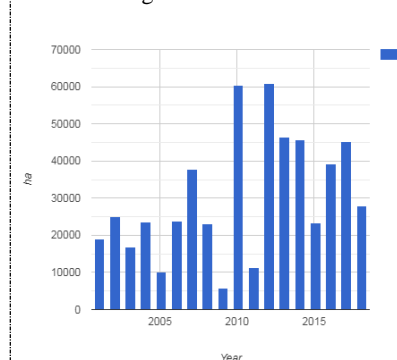
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018²⁸²

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is extremely vulnerable to wildfire; highly vulnerable to droughts, river and coastal floods; and medium to high vulnerability to water scarcity, earthquakes, and extreme heat.²⁸³ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events and the potential reduction in tree cover could have a significant impact on soils (e.g. increased erosion).

²⁸² Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

²⁸³ Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

RIO GRANDE DO NORTE

Precipitation

The average annual rainfall is approximately 671 mm/year decreasing by 46.14 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 162.29 mm while October presents the lowest average rainfall at 4.63 mm. Rainfall patterns are erratic with deviations ranging from -124.69 to 218.62 mm.

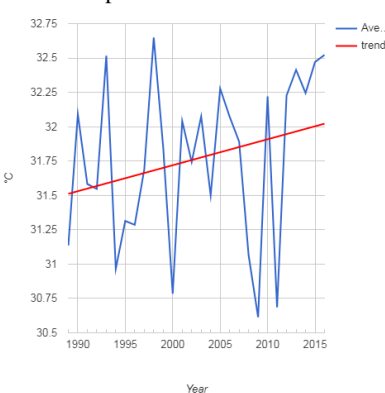
Temperatures

The average annual minimum temperature is 22.48°C, while the maximum temperature is 32.02°C. For the period 1981 – 2016 November presents the highest average temperature at 33.52°C, while July was the lowest at 29.99°C; minimum and maximum temperature have increased by 0.50°C and 0.51°C respectively.

Land Productivity Dynamics

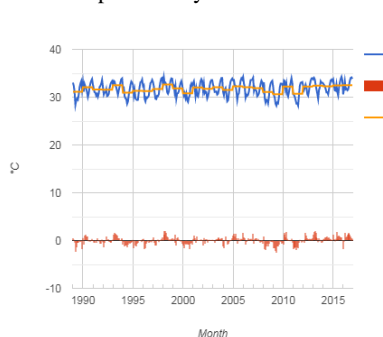
Caatinga portion of Semiarid Rio Grande do Norte has 77% of land with declining productivity, an additional 6.82% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



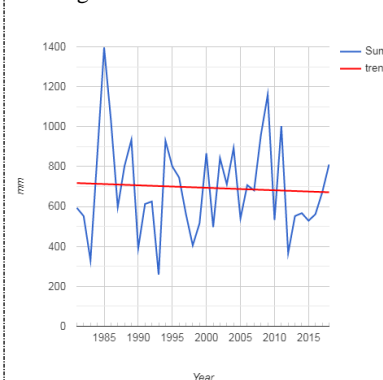
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2016



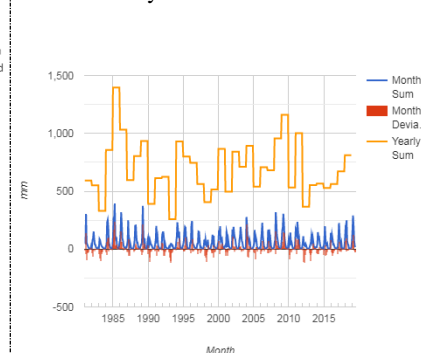
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



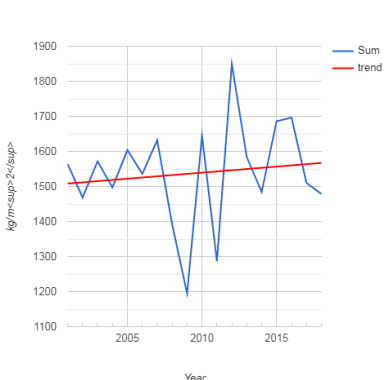
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



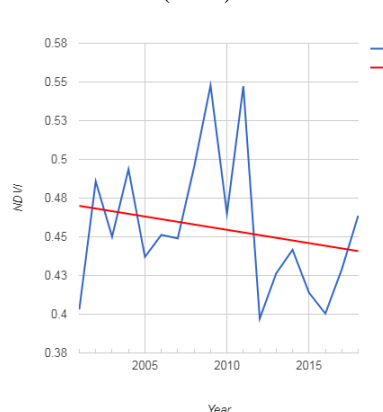
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



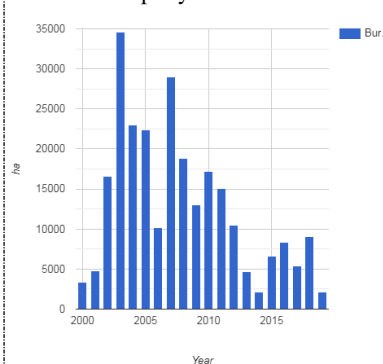
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



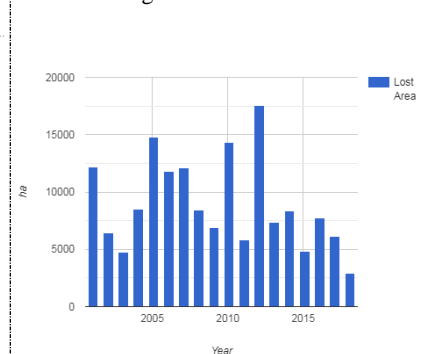
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018²⁸⁴

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and wildfire; and medium to high vulnerability to water scarcity, earthquake, and extreme heat; and low to very low risk of cyclones and tsunamis.²⁸⁵ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

²⁸⁴ Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

²⁸⁵ Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

PARAIBA

Precipitation

Average annual rainfall is approximately 693 mm/year decreasing by 4.69 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 155.83 mm while October presents the lowest average rainfall at 7.85 mm. Rainfall patterns are with deviations ranging from -99.98 to 249.23 mm.

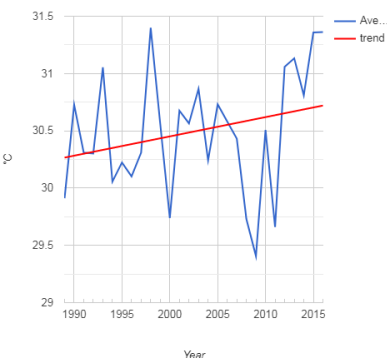
Temperatures

The average annual minimum temperature is 20.77°C, while the maximum temperature is 30.72°C. For the period 1981 – 2016 December presents the highest average temperature at 32.175°C, while August was the lowest at 18.87°C; minimum and maximum temperature have increased by 0.45°C and 0.45°C respectively.

Land Productivity Dynamics

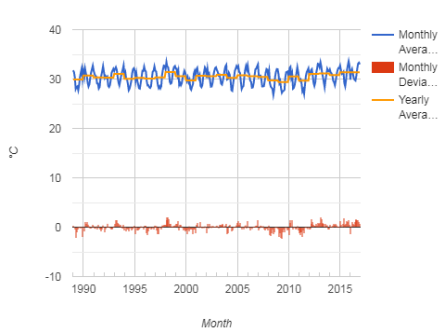
Caatinga portion of Semiard Paraiba has 80% of land territory with declining productivity, an additional 5.38% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



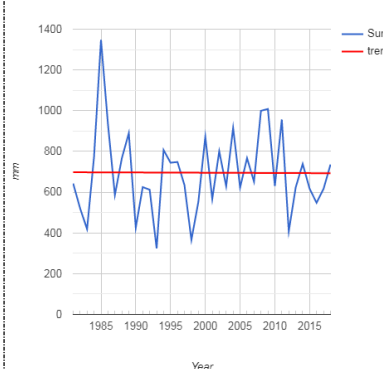
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2019



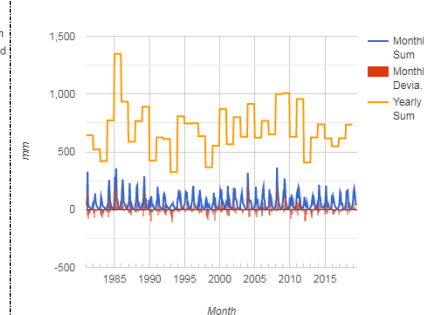
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



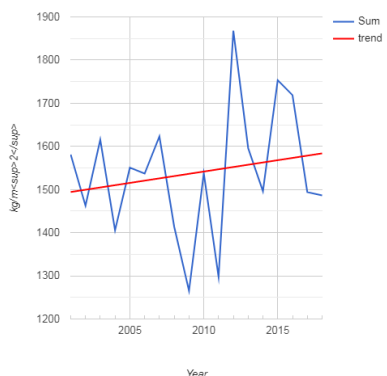
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



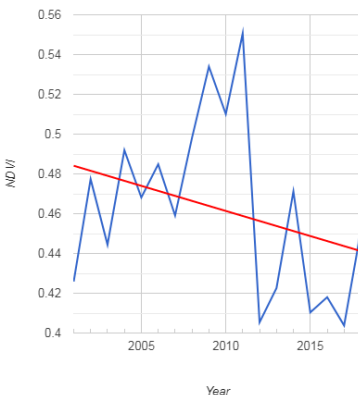
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



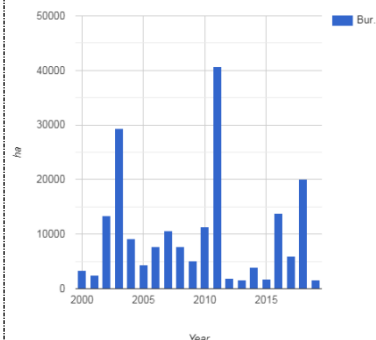
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



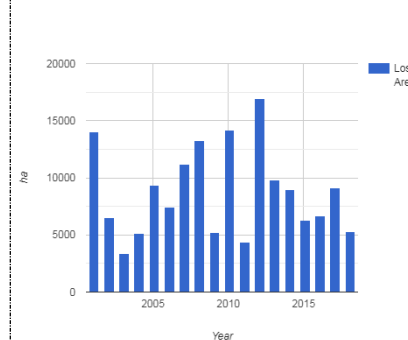
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018²⁸⁶

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, and wildfire; and medium to high vulnerability to river floods, earthquakes, water scarcity and extreme heat.²⁸⁷ Paraiba presents the smallest variations to date in temperature and precipitation, the region is nonetheless still at risk of decreased precipitation and increased temperature with potential negative impacts on the agricultural sector. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

²⁸⁶ Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

²⁸⁷ Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

PERNAMBUCO

Precipitation

Average annual rainfall is approximately 570 mm/year decreasing by 57.55 mm since 1981. For the period 1981 – 2019, March has been the rainiest month on average with 127.067 mm while September presents the lowest average rainfall at 9.06 mm. Rainfall patterns are erratic with deviations ranging from -100.67 to 255.82 mm.

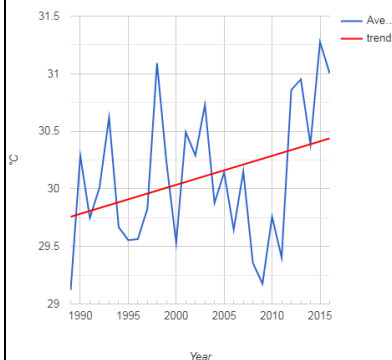
Temperatures

The average annual minimum temperature is 20.42°C, while the maximum temperature is 30.44°C. For the period 1981 – 2016 November presents the highest average temperature at 32.38°C, while August was the lowest at 18.08°C; minimum and maximum temperature have increased by 0.39°C and 0.68°C respectively.

Land Productivity Dynamics

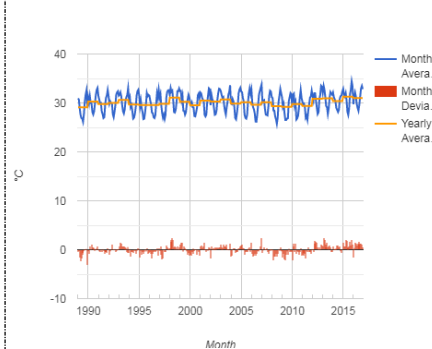
Caatinga portion of Semiard Pernambuco has 82% of land territory with declining productivity, an additional 8.89% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



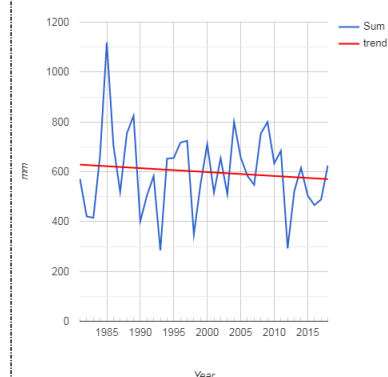
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2019



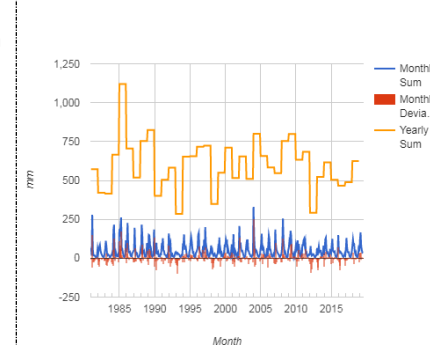
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



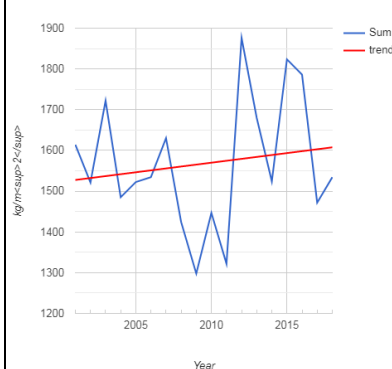
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



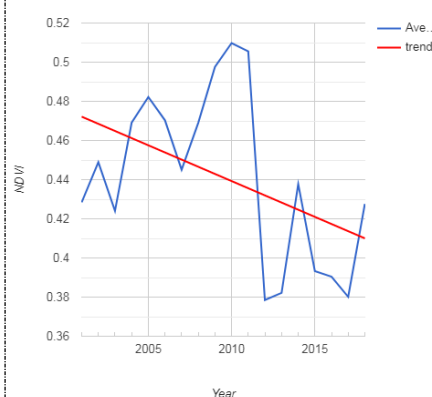
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



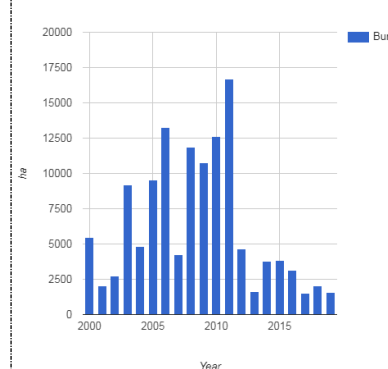
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



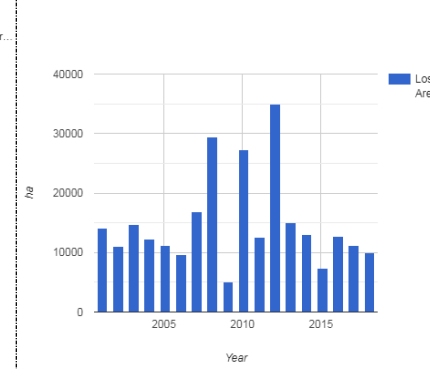
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018²⁸⁸

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and wildfire; and medium to high vulnerability to water scarcity and extreme heat.²⁸⁹ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

²⁸⁸ Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

²⁸⁹ Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

ALAGOAS

Precipitation

Average annual rainfall is approximately 673 mm/year decreasing by 60.98 mm since 1981. For the period 1981 – 2019, July has been the rainiest month on average with 116.74 mm while November presents the lowest average rainfall at 17.94 mm. Rainfall patterns are erratic with deviations ranging from -75.51 to 196.14 mm.

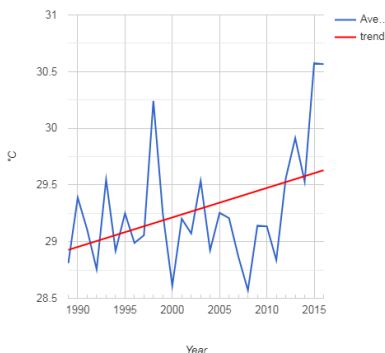
Temperatures

The average annual minimum temperature is 21.37°C, while the maximum temperature is 29.63°C. For the period 1981 – 2016 December presents the highest average temperature at 31.82°C, while August was the lowest at 19.06°C; minimum and maximum temperature have increased by 0.58°C and 0.70°C respectively.

Land Productivity Dynamics

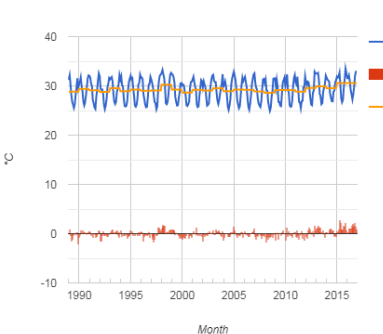
Caatinga portion of Semiard Alagoas has 64% of land territory with declining productivity, an additional 3.19% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



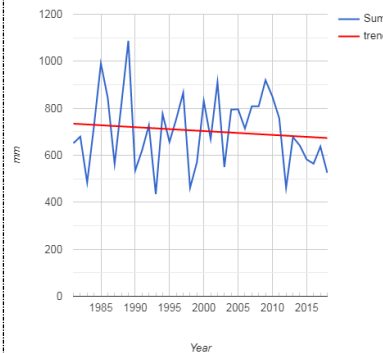
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2019



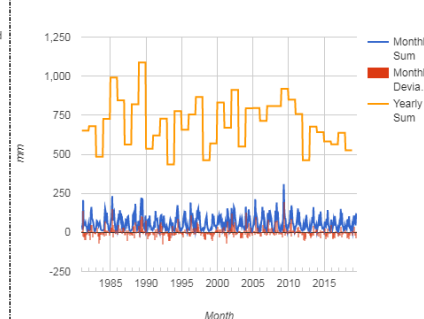
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



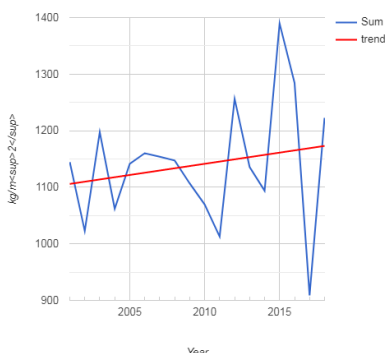
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



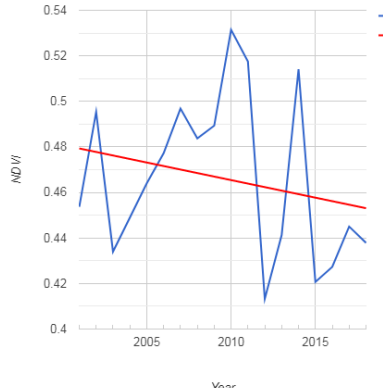
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



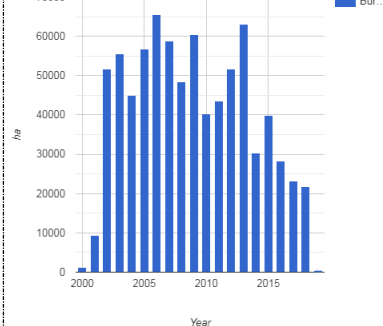
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



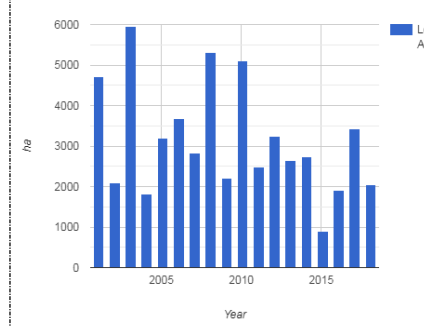
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018²⁹⁰

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river and coastal floods, and wildfire; and medium to high vulnerability to water scarcity and extreme heat.²⁹¹ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

²⁹⁰ Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

²⁹¹ Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

SERGIPE

Precipitation

Average annual rainfall is approximately 735 mm/year decreasing by 12.01 mm since 1981. For the period 1981 – 2019, June has been the rainiest month on average with 124.44 mm while October presents the lowest average rainfall at 29.097 mm. Rainfall patterns are erratic with deviations ranging from -68.27 to 185.09 mm.

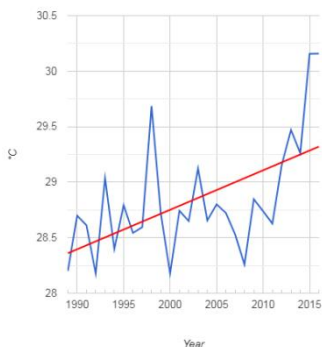
Temperatures

The average annual minimum temperature is 21.°C, while the maximum temperature is 29.32°C. For the period 1981 – 2016 December presents the highest average temperature at 31.27°C, while August was the lowest at 19.03°C; minimum and maximum temperature have increased by 1.01°C and 0.96°C respectively.

Land Productivity Dynamics

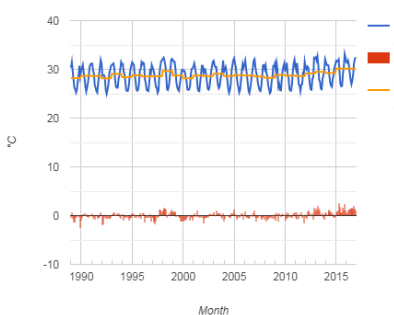
Caatinga portion of Semiard Sergipe has 71% of land territory with declining productivity, an additional 8.44% present early signs of decline or are stable but stressed. Similar patterns apply throughout the entire region.

Max Temperature 1989 – 2016



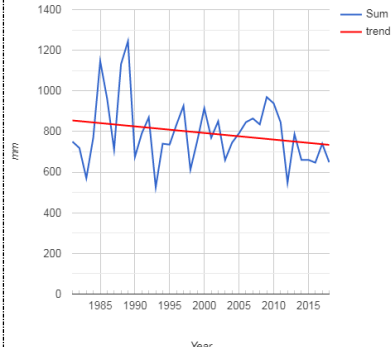
Source: ECMWF; ENSEMBLES

Max temp. Monthly time series 1989-2019



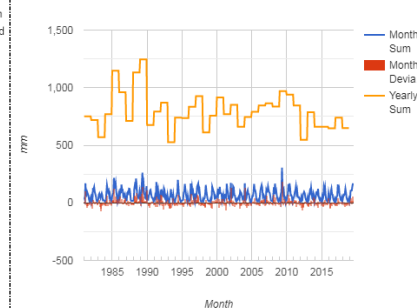
Source: ECMWF; ENSEMBLES

Average Annual Prec. 1981 - 2019



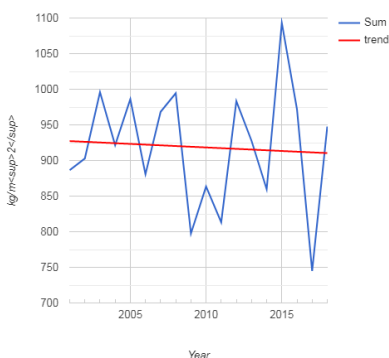
Source: CHIRPS (v2.0)

Prec. monthly time series 1981 – 2019



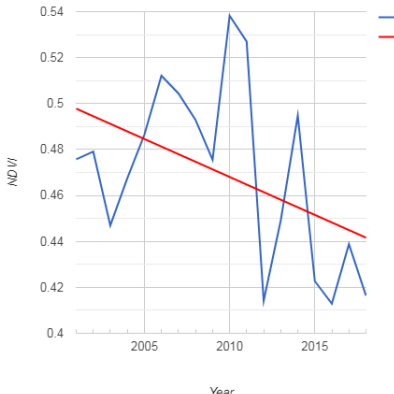
Source: CHIRPS (v2.0)

Climatic Water Deficit 2001 – 2018



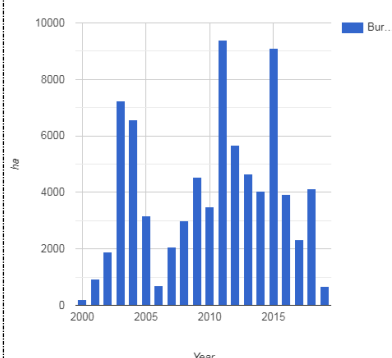
Source: MOD16A2 - MODIS/Terra Net Evapotranspiration 8-Day L4 Global 500 m SIN Grid

NDVI MODIS (250m) 2001-2018



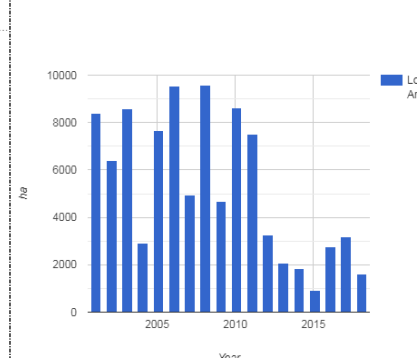
Source: NDVI from NIR-RED bands - MOD13Q1.006 Terra Vegetation Indices 16-Day Global 250m

Burned area per year 2000-2018



Source: MCD64A1: MODIS/Terra and Aqua Burned Area Monthly L3 Global 500 m SIN Grid V006

Forest Change 2000 - 2018



Source: Global Forest Change 2000–2018²⁹²

Climatic Vulnerabilities and Risks

Modeled projections of future climate identify a likely increase in drought tendency and in the frequency of fire weather occurrence in this region, including an increase in temperature and greater variance in rainfall. The project area is highly vulnerable to droughts, river floods, and wildfire; and medium to high vulnerability to coastal flooding, water scarcity and extreme heat.²⁹³ The annual decrease in rainfall in the region and the increase in temperature could have a negative impact on the agricultural sector if trends continue. The dry period will be even warmer, droughts may be more intense and frequent, and natural vegetation may suffer from water stress. Given interannual seasonality, it is likely that plantations and rain-dependent crops will decrease their productivity in the coming years. In addition, the increase in extreme events could have a significant impact on soils.

²⁹² Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342 (15 November): 850–53.

²⁹³ Global Facility for Disaster Reduction and Recovery (GFDRR), 2019. "Think Hazard tool"

Project: Planting Resilience in Rural Communities of the Brazilian Semi-arid

Feasibility Study

APPENDIX V

Results Management Framework

Fund-level impacts						
Select the appropriate impact(s) to be reported for the project/programme. Select key result areas and corresponding indicators from GCF RMF and PMFs as appropriate. Note that more than one indicator may be selected per expected impact result. The result areas indicated in this section should match those selected in section A.4 of the funding proposal. Add rows as needed.						
Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	A1.2 Number of males and females benefiting from the adoption of diversified, climate resilient livelihood options (including fisheries, agriculture, tourism, etc.)	Tracking of TRIPs investments, and resilience scorecard at baseline mid-term and completion.	0	Male 240,000 Female 160,000	Male 600,000 Female 400,000	4 people per family. Indicator will be segregated by gender and age. Target: 50% youth and 40% women.
	Percentage of women reporting improved empowerment index at project level	Project-level women's empowerment index (pro-WEAI) at baseline and completion	0	0	70%	
A2.0 Increased resilience of health and well-being, and food and water security	A2.2 Number of food secure households (in areas/periods at risk of climate change impacts)	Resilience Model scorecard at baseline, mid-term and completion.	0	21,440	53,600	80% success rate of subcomponent 1.2 (Result 2, Table E.5).
	Households with infrastructure for access to water operational report a reduction in the water shortfall in relation to the production requirements	Tracking of funded TRIPs, and completion study.	0	11,520	28,800	80% success rate of Component 2 (Results 5 and 6). Availability of water for production.

<i>A4.0 Improved resilience of ecosystems and ecosystem services</i>	<i>A4.1 Coverage/scale of ecosystems protected and strengthened in response to climate variability and change</i>	Studies of satellite imagery in areas with recovered vegetation. Mid-term and completion.	0	14,400 hectares	36,000 hectares	100% success rate of Activity 1.3.1 (Part of Result 4). Collective areas sustainable management.
<i>M4.0 Reduced emissions from land use, reforestation, reduced deforestation, and through sustainable forest management and conservation and enhancement of forest carbon stocks</i>	<i>M4.1 Tonnes of carbon dioxide equivalent (t CO₂ eq) reduced or avoided (including increased removals) - forest and land use</i>	Tracking of funded TRIPs, and completion study.	0	0	11M tCO _{2e}	Carbon emission measurements will take place from the midterm evaluation to the final using GIS.

Project/programme performance indicators

The performance indicators for progress reporting during implementation should seek to measure pre-existing conditions, progress and results at the most relevant level for ease of GCF monitoring and AE reporting. Add rows as needed.

Expected Results	Indicator	Means of Verification (MoV)	Baseline	Target		Assumptions
				Mid-term	Final	
Output 1. Territorial Resilience Investment Plans (TRIPs)	Baseline studies to profile families willing to receive investments from projects	Baseline report and implementation support/supervision missions.	0	–	3	1 study per state
	TRIPs developed	Tracking of funded TRIPs, and completion study.		230	575	2300 communities, 4 communities per plan
Output 2. Household Resilient Investment	Families benefited by CRPS (by gender and age; 40% women and 50% youth)	Tracking of PMEL ²⁹⁴ system, field sampling verification	0	Male 16,080 Female 10,720	Male 40,200 Female 26,800	
	Number of persons provided with climate information services	Tracking of PMEL system and supervision missions.	0	49,600	124,000	4 people per family
Output 3. Collective Resilient Investment	Families benefited collective areas CRPS	Tracking of PMEL system, field sampling verification	0	41,200	103,000	
Output 4. Farmers and Entrepreneurship support	People trained in production practices and/or technologies. (by sex and age; 40% women and 50% youth)	Tracking of PMEL system and supervision missions.	0	Male 5,760 Female 3,840	Male 14,400 Female 9,600	
	Fund for micro-enterprises to develop CRPS suppliers	PMEL Team tracking of investments, and supervision missions.	0	28	70	
Output 5. Water access technologies for harvesting, reuse, treatment and storage	Families benefited by rainwater harvest and storage	Tracking of PMEL system and supervision missions.	0	8,400	21,000	
	Hectares of farmland with water-related	Tracking of PMEL system and supervision missions.	0	1,800 hectares	4,500 hectares	

²⁹⁴ Project Management Accountability System (PMEL).

	infrastructure built/rehabilitated					
	Families benefited by treatment and reuse of grey and blackwaters.	Tracking of PMEL system and supervision missions.	0	6,000	15,000	
Output 6. Capacity awareness building and	Women, youth and traditional communities build capacity	Inputs from PMU Gender, Youth and Ethnicity team, tracking of PMEL system and supervisions missions	0	3,600	9,000	
	Young communicators using social communication tools to register and systematize activities developed in communities.	Inputs from PMU Gender, Youth and Ethnicity team, tracking of PMEL system and supervisions missions	0	166	414	
Output 7. Scaling-up and sharing	Number of learning routes (national and international), thematic studies and policy dialogue working groups	Tracking of PMEL system and supervision missions.	0	3 learning routes; 3 thematic studies; 3 working group	7 learning routes; 8 thematic studies 3 working groups	
Output 8. Planning, Knowledge Management and M&E	Seminars promoted and documents elaborated support knowledge diffusion (i.e. studies, systematizations and knowledge management).	Tracking of PMEL system and supervision missions.	0	30	75	
Output 9. Effective Management	Financial/physical execution of the AWPB surpasses 75% each.	Tracking of PMEL system, financial reports, and supervision missions.	0	-	>75%	

Activities

All project activities should be listed here with a description and sub-activities. Significant deliverables should be reflected in the implementation timetable. Add rows as needed.

Activity	Description	Sub-activities	Deliverables
Activity 1.1. Selection of Project Areas and development of TRIPs	Selection of communities to receive investments. Design of TRIPs with full involvement of selected communities.	-Selection of States, -Define the project area in each State, -Select the target audience - TRIP design - TRIP approval	State proposals. One study per state to select project area 575 TRIPs designed and approved
Activity 2.1 Implement CRPS in family farms	Application of productive activities following the six principles and practices of CRPS, not only to increase resilience but also to contribute to increase families' production, efficiency and nutrition.	- Implement CRPS - Provide TA for implementation	31,000 families benefited
Activity 2.2 Implement backyard gardens using CRPS	Application of productive activities following the six principles and practices of	- Implement CRPS in conjunction with activities in Component 2;	36,000 families benefited

	CRPS, not only to increase resilience but also to contribute to increase families' production, efficiency and nutrition and encourage women's leadership.	- TA	
Activity 3.1 Implement Collective Areas Sustainable Management (CASM)	Improve the ecosystem services provided by the <i>Caatinga</i> , such as microclimate regulation, carbon capture, sequestration and fixation, pest and disease control, water supply, waste decomposition, natural pollination of crops and other plants, and supply of raw materials (e.g. wood, oilseeds and fruits)	<ul style="list-style-type: none"> - Recover degraded areas using CRPS; - Decrease timber demand by implementing eco-efficient stoves and biodigesters; - Increase supply and efficient use of water for production; and - Structure community seedbanks and nurseries; - Promote low-impact productive activities in collective areas (e.g. beekeeping). - TA 	1,800 families benefited
Activity 3.2 Implement CRPS in Schools	Implementation of climate-resilient agricultural practices in schools.	<ul style="list-style-type: none"> - CRPS teaching and experimentation; - Development and maintenance of nurseries and seedbanks; - Promotion of entrepreneurship in CRPS; and - Training cooks and students on the nutritional value of native fruits and vegetables to diversify and enrich diets - TA 	100 schools benefited
Activity 3.3 Test productive models of Biosaline agriculture	Implementation of Biosaline agriculture practices in communities with installed desalination devices.	<ul style="list-style-type: none"> - Fish breeding; - Irrigation of halophyte plants in small areas 	1,200 families benefited
Activity 4.1 Build a Farmers Network	<p>Technical Assistance and Farmer Trainers are trained to enhance their knowledge on CRPS, water access and gender/youth/traditional communities sensitive approach.</p> <p>Farmers participate in workshops and visits to improve their knowledge of productive practices and new technologies.</p>	<ul style="list-style-type: none"> - training sessions - Exchanges carried out at local and regional levels; - Workshops and training for family farmers and community leaders promoted 	<p>550 professionals trained</p> <p>24,000 participants</p>
Activity 4.2 Promote local entrepreneurship for products and services that support family farming	Promotion of entrepreneurship in CRPS		70 microenterprises supported
Activity 5.1 Build boardwalk cisterns	Build a rainwater reservoir to produce food, forage, seedlings and/or animal water consumption.	<ul style="list-style-type: none"> - Building cisterns with community participation; - Irrigation systems - TA 	20,000 cisterns and irrigation systems

Activity 5.2. Implement social technologies for water supply	<p>Trench barriers. Build trench to store rainwater to be used to produce food, forage, seedlings and/or animal water consumption.</p> <p>Groundwater Storage. Build small underground dams to store water to produce food, seedlings, forage and/or animal water consumption.</p>	<ul style="list-style-type: none"> - Building trench barriers with community participation; - Irrigation systems - TA - Building underground dams with community participation; - Irrigation systems - TA 	<p>500 trench barriers and irrigation systems</p> <p>500 underground dams and irrigation systems</p>
Activity 5.3 Implement treatment and reuse systems for household wastewater	<p>Greywater reuse. Water treatment systems that allow greater water availability for food production.</p> <p>Blackwater treatment. Biological treatment of sewage and biomass production</p>	<ul style="list-style-type: none"> - Building greywater treatment systems with community participation; - Irrigation systems - TA - Build wastewater biological treatment systems with community participation; -TA 	<p>10,000 treatment and irrigation systems</p> <p>5,000 treatment systems</p>
Activity 6.1 Develop a young communicators network	Young communicators use social communication tools to register and systematize actions developed in communities.	<ul style="list-style-type: none"> -Workshops for youth communicators; - Inter-state exchange visits; -Inter-regional exchange visits; - Training for youth; -Learning scholarships for youth. 	414 young communicators
Activity 6.2 Strengthen capacity for women, youth, and traditional communities	Events for the inclusion of women and traditional communities in processes of decision-making and knowledge-sharing of sustainable technologies.	<ul style="list-style-type: none"> -Training for Women on sustainable technologies; - Workshops and meetings for Women; - Exchange visits for women; - Training for TA in Gender approach, race and ethnicity; - Compilation of Case Studies Childcare support activities 	699 events promoted and 3 case studies developed
Activity 7.1 Promote South-South Cooperation	Capacity building through the exchange of knowledge, skills, resources and technologies across countries.	<ul style="list-style-type: none"> - National Learning Route / Exchange-Visit; - International Learning Route / Exchange visit (LAC); - International Learning Route / Exchange Visit (Africa) 	7 events promoted
Activity 7.2 Facilitate discussions to unlock policy barriers	Actions for influencing and disseminating public policies with the goal to support CRPS in family farms.	<ul style="list-style-type: none"> - Thematic studies; - Forums and Meetings at local, state and federal levels 	8 studies and 103 events carried out 3 working group moderators
Activity 7.3 Experimentation of a CRPS participatory monitoring model	Building a monitoring methodology that can be applied with CRPS demonstrations in each territory, allowing clear visualization of socio-environmental transformations that will occur during the intervention period.		108 events
Activity 3.4.1 Planning, M&E and KM at National level	Studies and Workshops		75 documents elaborated or events carried out

Activity 3.4.2 Planning, M&E and KM at State level	Technical activities for projects' follow-up, monitoring results and publicizing good practices.	<ul style="list-style-type: none"> - National Impact Evaluation; - GIS Evaluations; - Planning and Communication Services; - M&E Services; - Planning Workshops; - Studies and other KM products. - Compilation of Studies and other KM products; - Planning Workshops; - Territorial Committee Meetings; - M&E Meetings 	32 documents elaborated
PMU Investment Costs	Investments in equipment and workshops to train Project teams.	<ul style="list-style-type: none"> - Inputs and equipment; - Workshops and training for PMU Staff. 	244 equipment and 42 capacity building events
PMU Recurrent Costs	Team of experts carries out the projects' implementation.	<ul style="list-style-type: none"> - Recurrent Costs. 	16 professionals engaged in the implementation of the project's actions

Project: Planting Resilience in Rural Communities of the Brazilian Semiarid

Feasibility Study

APPENDIX VI

Images referring to Social Technologies (See Section 4.2.3)

I. Eco-stoves (Fogões ecoeficientes)



Photo A - Newly built eco-efficient stove in the kitchen of a country house



Photo B - Stove on the outside of a country house.²⁹⁵

²⁹⁵ SARAIVA, D. P.; XENOFONTE, G. H. S. **Fogão geoagroecológico**. Ouricuri, PE: CAATINGA, 2014. 28 p.



Photo C - Farmer by her stove ²⁹⁶.

II. Biodigestors (Biodigestores)



Photo D – Farmer couple, “loading” their biodigester with water and manure²⁹⁷

²⁹⁶ IDER. **Fogões ecoeficientes. Manual de construção.** Fortaleza: Instituto de Desenvolvimento Sustentável e Energias Renováveis (IDER); Associação Caatinga; Projeto Clima na Caatinga, Sem data. Disponível em: <http://www.terrabrasil.org.br/ecotecadigital/pdf/fogoes-eco-eficientes-manual-de-construcao.pdf>

²⁹⁷ MATTOS, L. C.; FARIAS JR, M. **Manual do biodigestor sertanejo.** Recife: Projeto Dom Helder Camara, 2011. 55 p.



Photo E - Sertanejo family, next to the bidigester ²⁹⁸

III. Cistern (Calçadão)



Photo F - Farmer showing her vegetable garden bed, irrigated with water from the cistern. S. do Araripe, 08.2011 ²⁹⁹

²⁹⁸ MATTOS, L. C.; FARIAS JR, M. **Manual do biodigestor sertanejo**. Recife: Projeto Dom Helder Camara, 2011. 55 p.

²⁹⁹ Foto: Pablo Sidersky



Photo G - Cistern - sidewalk, with manual pump³⁰⁰



Photo H – 52 thousand litre cistern in construction³⁰¹

³⁰⁰ ASA-BRASIL. **Cisterna - Calçadão**. 10a. edição. Recife, PE: Articulação do Semiárido Brasileiro, 2014. Disponível em: https://www.asabrasil.org.br/acervo/publicacoes?artigo_id=273&start=10

³⁰¹ ASA-Brasil, as in foot-note above.



Photo I – Sidewalk in construction³⁰²



Photo J - Vegetable garden, irrigated with production cistern water (52 thousand liters), Ceará, 06.2016³⁰³

³⁰² ASA-Brasil, as infofoot-note above.

³⁰³ Foto: Pablo Sidersky

IV. Underground dam (Barragem subterrânea)



Photo K- Tractor with mechanical shovel dug into an underground dam (BS)³⁰⁴



Photo L- Placement of canvas for the construction of an underground dam ³⁰⁵.

³⁰⁴ MELO, R. F. D. et al. **Barragem Subterrânea: Tecnologia para Armazenamento de Água e Produção de Alimentos.** Circular Técnica, 104. Petrolina, PE: Embrapa Semiárido, 2013. Disponível em: www.cpatsa.embrapa.br

³⁰⁵ OLIVEIRA, J. B.; ALVES, J. J.; FRANÇA, F. M. C. **Barragem subterrânea.** Fortaleza, CE: PRODHAM – Projeto de Desenvolvimento Hidroambiental do Estado do Ceará, 2010. 31 p.



Foto M – Vista de uma barragem subterrânea terminada. Note-se o cacimbão feito de anéis de cimento e o barramento de pedra que marca o local onde está a valeta com a lona enterrada. Photo M - View of a finished underground dam. Note the cacimbão made of cement rings and the stone dam that marks the place where the ditch with the buried tarp is ³⁰⁶

V. Greywater reuse system (Sistema de reuso de águas cinzas)



Photo O - Agroecological backyard irrigated with water from a Family Bio Water Treatment System ³⁰⁷

³⁰⁶ OLIVEIRA, J. B.; ALVES, J. J.; FRANÇA, F. M. C. **Barragem subterrânea**. Fortaleza, CE: PRODHAM – Projeto de Desenvolvimento Hidroambiental do Estado do Ceará, 2010. 31 p.

³⁰⁷ SANTIAGO, F. et al. **Bioágua Familiar. Reuso de água cinza para produção de alimentos no Semiárido**. Recife: Projeto Dom Helder Camara-SDT-MDA, 2012. 19 p.



Photo P - Agro-ecological backyard of Family Bio-water System, in the municipality of Olho d'Água dos Borges, RN ³⁰⁸

VI. **'Green pit' - Simplified sewage treatment system ('Fossa verde' – Sistema simplificado de tratamento de esgoto)**

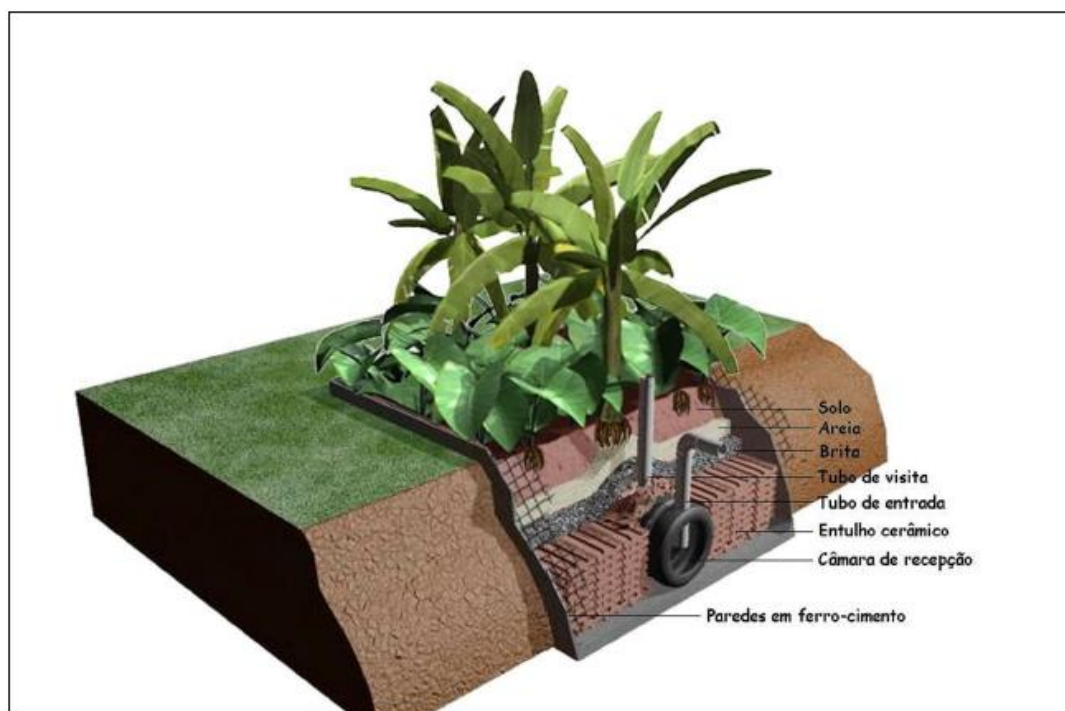


Photo Q - Perspective cut of 'green pit' or Evapotranspiration tank.³⁰⁹

³⁰⁸ Foto: Pablo Sidersky

³⁰⁹ GALBIATI, A. F. **Tratamento domiciliar de águas negras através de tanque de evapotranspiração.**(Dissertação de Mestrado). Centro de Ciências Exatas e Tecnologia, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, 2009



Photo R - Photographic record of a green pit planted with banana trees and other crops ³¹⁰

³¹⁰ GALBIATI, A. F. **Tratamento domiciliar de águas negras através de tanque de evapotranspiração**. (Dissertação de Mestrado). Centro de Ciências Exatas e Tecnologia, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS. 2009

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex: Appendix 2. Working Paper 2 Gender Assessment And Action Plan 060420

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

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GENDER ASSESSMENT:

Planting climate resilience in rural communities of the Northeast (PCR)

1. Introduction

Women are more vulnerable to the effects of climate change since they constitute the majority of the world's poor and have been historically socialized to take care of natural resources, which are increasingly threatened by precarious environmental conditions. Disasters and climate-change-related crises have been happening more frequently over the last decade, and it is evident that their impacts are disproportionately felt by those socially excluded and living in poverty. Thus, women and children have 14 times more probability of dying in climate-related disasters than men.¹ Moreover, the lack of resilience of people dealing with such catastrophes is exacerbated by inequality.

Research indicates that women and young girls living in rural areas of Brazil's Northeast, the project's target region, are the most vulnerable to climate change-related risks in the country (CEPAL 2016). They also face social, economic, and political barriers that limit their capacity for adaptation, as they have no access to effective and lasting policies and programs that address socioenvironmental adversities. Despite the strengthening of the women's movement's organizational power in Brazil, especially in the last 15 years, the lack of gender-transformational policies attentive to women's needs and other gender issues is notable in climate-change mitigation and adaptation initiatives. Research has proven that the only efficient way to combat climate change is by improving the resilience of those living at risk, such as women. The project "Planting climate resilience in rural communities in the Northeast" (PCR) takes this into serious consideration.

Socioenvironmentally the most vulnerable groups (women, young people, and traditional communities) have been able to lead changes to overcome hardships they face. These initiatives should be fostered by the actions proposed in the PCR Action Plan. For example, studies show the important role that non-timber forest products (NTFPs) (such as medicinal plants, animals, fruits, etc.) play in adaptation to climate change. In all countries, women often engage in collection / sale of NTFP products for subsistence when other income-generating activities are not feasible.

Research studies have shown on rural farms, mostly it is women who are the ones engaged in agroecological transition. They introduce innovations in productive arrangements, which in many cases leads to intra-family conflicts, usually due to the resistance of men (husbands and children) to change to new models of agricultural production initially perceived as more expensive and less profitable. Women are often the first to coordinate productive processes in the logic of diversification, seeking ways to plant "a little bit of everything" in a variety of ways within different productive agricultural spaces and to seek sustainable practices that do not harm the environment and make full use of local resources.

As set forth in CEDAW² General Recommendation No. 34, while women have played a traditional role as managers of natural resources, State parties often fail to acknowledge the

¹ For further information, see: "The South Asia Women's Resilience Index: Examining the role of women in preparing for and recovering from disasters." Economist Intelligence Unit, 2014 (available at: <https://www.gdnonline.org/resources/The%20South%20Asia%20Women%27s%20Resilience%20Index%20Dec8.pdf>).

² The Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) was adopted by the United Nations General Assembly on 18 December 1979, and entered into effect on 3 September 1981. It consists of a preamble and 30 articles, 16 of which identify substantive rights that must be respected, protected, guaranteed and promoted by the signatory State parties.

role of rural women and girls in unpaid work, their contribution to the Gross Domestic Product and, therefore, to sustainable development. It can be seen that women are generally excluded from processes and decisions on use and management of natural resources and territories. Participation of rural women in positions of political and social control in the field of environmental policies and agricultural development – all of which grew and intensified as a result of Brazil democratization process – has always been neglected. According to the *Forests and Gender*, published by the International Union for Conservation of Nature (IUCN): "As most of the world's biodiversity inhabits fragmented landscape mosaics outside protected areas, women and other community members who manage and use forests for a range of land-uses must also be considered as primary stakeholders" (Aguilar et al., 2011, p.22). The PCR project is based on the following assumption: Women should be considered "stakeholders" (parties involved / engaged) in management plans for non-timber agricultural activities. They play a vital role in promoting innovations in technology / methodology in sustainable agricultural systems that are resilient to climate change.

International agreements on women's human rights have made real progress in recent decades in acknowledging the multiple and diverse inequalities women experience, especially women in rural areas and women who belong to traditional communities (indigenous, fisherwomen, Afro-descendants). Some documents that address the inequalities rural women experience include the Beijing Platform for Action and the UN Committee on the Elimination of Discrimination Against Women.

It is also important to emphasize the organizational strength of autonomous rural women's organizations and movements in Brazil as a response to the lack of inclusion of rural women's agendas in rural workers' organizations, such as the Rural Women Workers Movement of the Northeast (MMTR-NE); the Movement of Women Farmers (MMAs), and then, under the name of the Movement of Peasant Women (MMC) integrated into the Via Campesina; and the Babassu Coconut Breakers Interstate Movement (MIQCB). In 2004, these women's movements and organizations held a productive dialogue with the State, and the Program for the Promotion of Gender, Race, and Ethnicity (PPIGRE) was created in the Ministry of Agrarian Development (MDA) to identify and address issues related to rural women and their interface with socio-environmental issues. From 2004 to 2015, significant progress was made in women's productive organizations, such as the Technical Assistance (ATER) Women policy, which set some important standards for building rural women's leading role in different regions of Brazil.

The PCR project presents a unique opportunity to leverage significant changes in the socioenvironmental field based on contributions by rural women. Rural women are not only indirect beneficiaries who benefit due to their belonging to the family nucleus, they are also protagonists who make valuable contributions in proposing and implementing strategies and actions.

In this gender assessment report, the first part will look at the precarious social situation that is the daily life of rural women in the Northeast region of Brazil, where the actions of the project will be implemented. The project will prioritize the difficulties and aspirations expressed by rural youth, a neglected segment in rural areas, so the issues affecting young rural women in particular will be underscored. The project's focus on young women is manifested in the proposed action plan.

In the second part, a detailed action plan will be prepared in the gender field, to be implemented in the beneficiary area during the project's life cycle. As a strategic action that integrates the first phase, a specific study on rural women's social position, their relationship with the environment, and their demands in two main areas – access to water and practices in

resilient productive systems – will be prepared. This study carried out through a participatory diagnosis will provide a basis for other strategic actions included in the Gender Action Plan as well as for the monitoring process.

2. Context of the conditions rural women face: gender-based social inequalities in the Brazilian Semiarid

Brazil continues to be one of the countries with the highest inequality rates in the world, and women in particular are affected. Recent research (2007) by the United Nations Development Program (UNDP) shows that although 27% of the urban poor in Brazil have managed to escape poverty in the last ten years, the remaining 73% have stagnated in a situation of chronic poverty. Among those more prone to chronic poverty are people with less education, the Northeast population, and informal workers. Among these groups, women are the poorest and most vulnerable.

In the Northeast, the number of families with women heads of household (families in which the leading provider is the woman) is increasing. In 2004, 32% of households were led by women, with the aggravating fact that 60% of these women did not receive any support from the fathers of their children. This reality illustrates the complete inequality of gender relations in terms of responsibility for future generations. In most states, heads of households are generally black women (FUNDAÇÃO CARLOS CHAGAS, 1998).

Half the population of the Northeast Semiarid region (more than 10 million people) have no income or only government assistance as their single source of income, and 59.5% are women (INSA, 2010). More than five million people (31.4%) earn below the minimum wage; 47% are women. About 5.5% of the population in this area earn an income two to five times above the minimum wage, the majority of these (67%) are men; and of the 0.15% of the area's population with income 30 times above minimum wages, only 18% are women (IBGE, 2000). In rural areas, only 5% of women's income is derived from agriculture. In contrast, the largest source of income for extremely poor men in rural areas comes from agricultural activities (85% earn their wages from agriculture).

Although rural women produce from 60–80% of food in developing countries, they have less than 2% of available land (FAO, 2011). Men presently control 87.3% of rural properties in Brazil and 94.5% of the country's total rural area (OXFAM, 2018). According to *Terrenos da Desigualdade* (2016), of the total number of rural farmers without land, there are almost twice as many women as men. The majority of farmers producing in areas <5 hectares are women, and 87.3% of women farmers in Brazil do not have access to technical assistance services (OXFAM, 2016).

According to census data (IBGE, 2014), 45.5% of rural women are inserted in the labor market, compared with 72.2% of rural men.³ By analyzing this data, it is essential to consider that, when engaging in domestic activities in a rural property, which is also characterized as their home, women have less opportunity and time to enter the labor market, unlike men, who tend to spend a few hours per week working in the productive sphere. According to the national household sample survey (PNAD, 2013), the majority of rural women (90.8%) devote 26.1 hours per week to domestic work, while 43.1% of men dedicate only 10.2 hours per week to this type of work (JALIL et al., 2017, p.64).

³ "Data indicate that 54.5% of rural women are not in the labor market, so they are soon characterized as 'unemployed,' since they are not in the formal market and their production does not enter into the accounts. However, its agricultural production corresponds to another type of economy: the economy of the fair, trade, solidarity economy and even donations" (JALIL et al., 2017, p.64).

Approximately 46.7% of rural women are involved in subsistence agricultural activities in Brazil, compared to 14.0% of rural men (IBGE, 2009). The most common types of farming activities in which rural women are engaged include: bird breeding (73.5%); mixed crop / livestock production (72.3%); horticulture / floriculture (63.0%) (IBGE, 2009). Conversely, among men, paid employment is predominant in almost all agricultural activities. Less than one third of the people in subsistence and unpaid activities are men. This data is crucial because it reveals women's greater participation in unpaid, subsistence, agricultural or non-agricultural activities. Clearly a wide range of women's contributions are not recognized as work and therefore are not accounted for in the market logic that governs the hegemonic concept of economics. The density of women's economic life and daily work is made invisible by the fact that most transactions and actions are not monetized or calculated for their insertion in formal markets. Although women participate in productive dynamics, working in almost all tasks of the property, they are generally excluded from decision making about resource, jeopardizing their personal and financial autonomy (SILIPANDRI; CITRÃO, 2011).

At the same time, in terms of economic initiatives of rural women, the National Mapping of the Solidarity Economy, which made up the National Information System on Solidarity Economy (SIES), implemented by the Federal Government, revealed the strong presence of rural women in economic practices that are outside the mercantile economy. It also points out the diversification of arrangements created by women for economic purposes. A study of productive rural organizations for women conducted in 2011 identified almost 800 groups composed exclusively of women and more than 9000 organizations made up of women producing handicrafts, plants, and benefitted foods, as well as providing services (FARIA, 2011). In the second stage of the mapping, conducted between 2009 and 2013, a total of 19,708 organized enterprises were identified, distributed across 2713 Brazilian municipalities (SILVA; CARNEIRO, 2014), more than half in rural areas (GAIGER, 2012). These mappings revealed that "women work proportionately more than men and run a considerable percentage of enterprises, illustrated by their greater community and social involvement" (GAIGER, 2012, pp. 19–20). This set of data and research shows that in all regions of the country, contrary to many political arguments, women are involved in economic processes, sometimes engaging more than men in productive activities. Women produce for subsistence while seeking ways to qualify their capacity for productive organization, seeking their insertion in local and regional markets. Yet, although in many enterprises women have a leading role in management processes, there are several weaknesses and gaps in their organizational processes that keep their products from achieving insertion in the formal market. Most ventures are informal, with little access to legal procedures. Other common problems are operational and structural, such as lack of working capital, difficulty in ensuring improved products and their distribution, and obstacles that prevent them from finding means of transportation to sell their products.

Women are more directly affected by climate-change impacts, particularly droughts and floods, which have severe repercussions for food and nutritional health and safety. In many developing countries such as Brazil, women are primarily the ones responsible for the search, management, handling and storage of water. In this context, extreme situations involving water deprivation due to prolonged droughts (as is the case in the semiarid region of Brazil) can lead to an increase in their workload. When water is scarce, women are the ones who must travel longer distances to look for water sources, carrying water in pots or cans for long distances, so that they put their safety at risk or spend hours waiting in line at the water-tank truck. Therefore, gender inequality is revealed in water resources management, conditions that are aggravated by erratic climate patterns. Survey data show that as natural resources (such as water) become scarcer, women's participation in resources management activities significantly increases.

In looking at the advances and setbacks in the field of public policies, it can be observed that during the period 2004–2016, many advances were made in rural public policies and programs; policies such as ATER, credit and public procurement, although targeted to the broader public of family agriculture, have adopted specific strategies for inclusion and support for agroecological production and marketing of rural women's production. For instance, in the case of the Food Acquisition Program (PAA), in 2012, contracts with women (as holders) accounted for 35% of the total, which grew in the next period. Resolution 44 of 2011 stipulated that 5% of the PAA's annual budget should be allocated directly to women (or mixed groups with at least 70% women). It also resolved that at least 40% of participants in the modes of Purchase of Family Agriculture with Simultaneous Donation and Local Direct Purchase with Simultaneous Donation should be women, and 30% in Stocks for Family Agriculture and Incentives for Production and Milk Consumption.

Since 2016, all previously established policies aimed at reducing social inequalities have suffered serious setbacks, leading to precariousness conditions currently experienced by women in rural areas. Policies on women's rights were cut to minimum functioning levels; there have been cuts in policies and social programs such as *Bolsa Família* and PAA, and no new ATER calls for women were issued. In this complex scenario of setbacks in public policies and services, the PCR faces the challenge of providing inputs for construction of mitigation and adaptation policies in the face of climate change, while at the same time contributing significantly to improved living conditions for rural women.

3. Guiding concepts on gender in the context of socioenvironmental projects

To guarantee transformations in gender balance in social relations, in addition to increasing empowerment of women, a crosscutting treatment of gender is needed in social projects, programs, and policies. The notion of gender mainstreaming in social projects, programs, and policies presupposes that gender permeates every aspect of all project cycle, from design to implementation and monitoring. The assumption is that gender must be intrinsic to the project's structure, reaching every aspect of the action plan, from activities programmed with beneficiaries to the monitoring and evaluation system. From this perspective, the project is committed to a crosscutting approach to gender, based on the understanding that it is not a mere addition or factor, but is intrinsic to the very structure. For the project to attain its goals depends on this gender-centered perspective.

Some lessons learned from a gender diagnosis conducted with six IFAD-supported projects in the Northeast semiarid region in December 2017 should be taken into account so that this project can incorporate the gender approach transversally in its goals, strategies, and actions. In most projects analyzed, the importance of prioritizing rural women as beneficiaries was clear. It was important to include targets indicating minimum rates of women's participation, in both the public benefited by the actions and in the technical team. Although specification of minimum participation numbers for segments considered to be more prone to situations of social exclusion (such as women) is an important measure, it is not sufficient and cannot be confused with an effective and cohesive implementation strategy that aims to overcome social inequalities. Therefore, affirmative measures can be understood as initial steps in a more encompassing and comprehensive approach. To truly ensure the mainstreaming of gender in a project, it is crucial to ensure compliance with some of the conditions listed below:

- 1) Projects that have one or two specialist(s) / consultant(s) in gender as part of the technical team undoubtedly tend to achieve more significant advances. Without such an expert, it becomes much more of a challenge to ensure that this approach gets incorporated into the

action plan. However, regardless of the arrangement of the project in question, there must be continuous investment in gender-transformational training processes for members of the technical and administrative teams to enable them to have a gender perspective when working with the target audience.

2) Building partnerships with gender-based organizations (preferably with a feminist approach) facilitates incorporation of the theme institutionally since these organizations can provide methodological approaches that support local and regional processes.

3) Strategies and actions for gender equality and women's empowerment must be funded in the budget, through allocation of resources in specific expenditure categories. This way, it is possible to guarantee affirmative actions in socio-environmental projects, as significant steps for achieving women's autonomy in the respective groups.

4) When possible, setting up an inter-institutional social oversight unit to monitor the actions implemented from a gender perspective, gender mainstreaming approach at the institutional level will be assured.

4. PCR's gender action plan: strategies and approaches

4.1 Phase I: Diagnosis focused on gender inequalities in the scope of PCR

The gender mainstreaming in a project with a socioenvironmental focus starts with diagnostic and research actions that are generally carried out in the first phase of project execution. From the survey and analysis of information about the aspects that interfere in the social condition of women and men in the sociopolitical and socio-environmental contexts in which the project is implemented, it is possible to build the foundations for a consistent and coherent action plan, aligned with the logical framework. To be effective, this action plan must guarantee the empowerment of women through two channels: 1) greater access to and control of resources and services; and 2) greater access to opportunities and capacity building.

Thus, gender analysis should be a starting point for the preparation of an intervention plan that will address the social vulnerabilities experienced by women on as well the potentialities of coping with gender inequalities. This qualitative diagnosis will be a complementary source to the information generated by the baseline study, most of which is grounded in quantitative indicators. It will be carried out by the technical assistance teams through a participatory methodology called Participatory Rural Appraisal, a set of techniques and tools that allow the social groups themselves to be both informants and executors so that they manage planning and development. Consultations with stakeholder institutions will complement the information generated in the diagnostic phase and based on other studies carried out by research centers, academic institutions, and multilateral agencies.

A caveat should be made here, concerning the diagnosis to be carried out in the first phase of the project. The main objective of this diagnosis is to identify the structural and cultural factors that facilitate or hinder the participation of women in socioenvironmental processes, especially in terms of women's access to goods, and monetary and non-monetary resources. According to studies by Moser and Satterthwaite (2008) and Carmen Deere (2002), both the level of social vulnerability and ability to adapt to adverse and precarious situations depend on the degree of access to resources, assets, and inputs (material or non-material). Research conducted around the world reveals that women tend to have limited access to inputs and resources (physical, financial, human, social, and natural), which undoubtedly represents a significant impediment to their process of social, economic and political autonomy.

Thus, a reference plan should guide this initial diagnosis, so that gender-based social disparities can be revealed, showing the different priorities of men and women; their capacities, skills, abilities and restrictions in the various productive activities; their access to and control of various types of resources; and their influence in the decision-making processes in the various collectives in the family and community. This conceptual framework, which serves as the project's backbone, will include the following dimensions: (i) access to and control of resources (human, social, natural, and economic); (ii) access to and control of benefits (monetary and non-monetary); (iii) decision-making; (iv) job title / division of tasks; (v) welfare (health, gender violence, among other factors).

Use of participatory techniques that are part of the Rural Participatory Appraisal is indicated to facilitate participation of various social actors and provide a multifaceted perspective on the topics addressed. The methods will be custom-tailored to respond more sensitively to the issues faced by rural women. In general, we recommend prioritizing the mappings of spaces (map, flowchart) and visualizations of temporal cut-outs (Timeline, River of Life, etc).

4.2 The gender action plan: guiding principles and operational forms

The action plan will be prepared based on the results gathered in the Rural Participatory Appraisal mentioned above, to overcome obstacles and stimulate the gender potentialities that are identified in the field of social relations and that fall within the several dimensions that make up the conceptual framework. In the intervention strategies outlined in the action plan, the project team should seek greater integration between the five dimensions of the conceptual framework.

The action plan will be built on some assumptions, detailed below. The project aims to stimulate sustainable agricultural practices that value the knowledge and skills of rural women, contributing to their autonomy and social, economic and political resilience. In this sense, the project will seek the social and productive inclusion of women taking into account the specific features of their identities and occupation in the different territories, as farmers, *gerazeiras*, *ribeirinhas* and fishers, which involve different ways of relating to the land and natural resources according to each socioenvironmental context. Any strategy focused on reducing gender inequalities is linked to the recognition and appreciation of women's knowledge and skills in sustainable use of natural resources and aims at empowering women so they can make decisions about the management of available resources. The project should also adopt measures to encourage women's participation in management and social control spaces, such as Food and Nutrition Security Forums and Councils, Territorial Commissions and Rural Development Committees, so they can focus on designing and monitoring policies that promote access to land, credit, and technologies adapted to the semi-arid context for production and commercialization.

Implementation of the action plan in the field of gender should be guided by the following prerequisites, criteria, and questions:

- Which groups (directly or indirectly) do the project's actions target and what is the composition of these groups?
- What is the composition of families that are part of the social fabric in the beneficiary communities and how can the power relations inherent in the family environment be characterized?
- How do effects of the themes addressed by the project differ for men and for women?

- Does the project help open possibilities and opportunities that combat gender inequalities?
- What are the capacities of the beneficiary women that can be channeled to advance the achievement of project goals?
- What should the methodological approach in planned actions be in order to facilitate participation of rural women, especially women in traditional communities?

It is essential to point out that a gender strategy is operationalized through construction of a gender action plan that does not exist in isolation, but which has the task of dialoguing with all project aspects, integrating the overall planning of the executing agency and the evaluation & monitoring mechanisms. The M&E system should not only ensure the collection and analysis of disaggregated indicators but also a balance between quantitative and qualitative indicators, since qualitative indicators are better able to capture changes in social relations⁴ by verifying shifts in the unequal power relations in different spheres. Throughout the project implementation cycle, evaluation meetings on gender-related impacts and women's empowerment should be held. These periodic evaluations should be incorporated into the project implementation report, midterm report, and final evaluation.

At the start of the project implementation cycle, the information collected in the baseline⁵ will be essential for constructing the monitoring plan, with special attention given to incorporating the gender perspective into the tools and methodological approach. It is also important to analyze inputs and outcomes from the gender perspective. And gender-specific budget allocation will ensure specific actions that strengthen the performance of rural women and contribute to a more even balance between the productive and reproductive fields in the exercise of their functions.

A planning / monitoring / systematization / evaluation system must be established, in order to verify changes in the functions carried out by rural women in promotion of sustainable practices and their degree of political, social and economic autonomy. In the first two to three years of the project implementation cycle, the young communicators and social communication / knowledge management advisors must seek an alignment between materials produced with indicators aimed at measuring changes in gender roles and social relationships in the monitoring system. The production and dissemination of materials that highlight good practices in the field of gender social relations will undoubtedly be an interesting way of showing progress in meeting the indicators both for the public served internally by the project and for public managers and representatives of institutions that are associated with the themes that guide intervention proposals.

5. Detailing the project's gender action plan

5.1 Some considerations about the approach selected

The pedagogical approach to be adopted in educational and organizational activities incorporates a feminist perspective, which focuses on the sexual division of labor and its repercussions in social life. The project's training processes aim to make the beneficiary

⁴ "Qualitative indicators" are indicators that express variables or dimensions that cannot be expressed by numbers only, such as: "increased self-esteem," "leadership capacity" or "changes in attitudes and behaviors," among others. While an indicator may help identify the quality of female participation, it can bring with it the difficulty of verification (WEITZMAN, 2006).

⁵ The purpose of the baseline study is to identify the ground-zero situation of target populations, that is, the starting point to which modifications will be compared. Information from the field will be compiled in a data verification system and analyzed through a rigorous system of statistical analysis.

population aware of this often-ignored fact: the overall domain of "care" is housed by the term "domestic work" or "reproductive labor," referring to unremunerated work, while work activities that generate value in the market (according to the postulates of economic sciences) are framed as components of "productive work." The project seeks to unveil the artificial separation between "productive labor" and "reproductive labor," showing that they are inseparable in women's lives and should both be valued accordingly, although currently a social hierarchy exists between the two.

The focus on "sexual division of labor" is concern not only with fostering greater engagement of women in "productive" processes but also with promotion of the concept of "care" work, to help beneficiary women avoid too oversized workloads. In an IFAD-supported project in the semiarid region of Bahia (*Projeto Viva Semiárido*), it is worth highlighting a pilot experience that is beginning and appears in the design of the *Ciranda das Crianças* project. The intervention is not limited to affirmative action enabling participation of women in the pilot activities, but encompasses other dimensions, all of which have been approached by the project's gender advisor in a progressive way, namely: (i) retrieval and appreciation of games that were common in previous generations; (ii) training children as future citizens with awareness of the importance of gender equality in relations; (iii) training women to play the role of *cirandeiras*, becoming local and regional references.

Regarding the methodological approach employed, it is essential to make some considerations. Workshops and meetings generally use a methodological approach that allows externalization of feelings from the sharing of life experiences, which results in greater awareness of one's social condition and consolidation of self-organization processes. The process of informal education is dialectical and complex and should contribute to appropriation of subjects -- not only techniques but also understanding of social and power relations in which the different subjects are involved in multiple dimensions: social, political, economic, cultural. Among the educational activities, the PCR emphasizes exchanges that are inspired by "peasant-to-peasant" methodology, based on the enriching learning that comes from practice, knowledge sharing, and recognition that examination of different realities is an essential factor in social change. In this methodology, organized rural women speak to women in the newly formed groups about their organizational process and what were the difficulties, advances, and changes experienced in the family and community. Such exchanges will strengthen the role of women fostering the proposal and experimentation of innovative methodologies and technologies aimed at social and environmental sustainability.

5.2 The main lines of action to be included in the gender action plan

5.2.1 Guaranteeing female representation (at least 40%) in technical teams and target populations

In order to adopt a gender-transformational approach to rural development, at least 40% of the technicians hired to provide technical assistance in the communities (including "experimental farmers" or "local talents") should be women, which will facilitate their protagonism in planned actions. In courses, meetings, and exchanges planned in the project, an effort will be made to maintain a balance between men and women in the target audience. The proportion of 40% of women will be more easily maintained in the *cirandas* initiative for child care during the planned activities. With regard to CRPS, it is important to ensure that at least 40% of family farms rely on women and young people to hold the leading role in the implementation cycle.

5.2.2 Consolidating partnerships with reference organizations working in gender issues and adopting a feminist approach

Building partnerships with local gender-oriented organizations should be fostered as a way to help incorporate the gender approach with a feminist perspective in the TA system, once these organizations can provide methods and tools that support local and regional processes.

Therefore, one of the project's first steps is to map the potential partner organizations in the scope of the project at the level of each State to support implementation of the gender strategy, under coordination of the contracted gender advisor(s). These reference organizations that will act in the dynamics of each PMU and should also be represented on the project's steering committee so that they can contribute to the global monitoring of strategies and actions.

5.2.3 Definition of guidelines for educational activities with a gender focus on rural women

Implementing affirmative actions that ensure the autonomy of women -- both in terms of technical assistance and capacity building, through educational activities and encouragement of participation in public policies spaces -- is an essential step for transforming gender balance in social relations in all spheres: family, community and society. To follow this path means to strive for a better quality of interventions, so that rural women can participate fully in the processes, exercising their citizens' rights, without entailing the overload of tasks. There must be measures in this project to guarantee the availability of care work, a work that fits the field of "social reproduction" and which plays a primary role in sustaining productive work, since these two fields of social and economic life are inseparable.

In addition to guaranteeing training opportunities for women (to encourage the process of self-organization), it is essential to support training opportunities involving mixed groups that address gender issues so that men gradually become aware of the importance of gender equality in their daily lives. Therefore, in the scope of the proposed exchanges and territorial meetings, a crosscutting gender approach should be incorporated into the overall thematic approach.

The following section presents the specific lines to be explored in this field of actions focused primarily on rural women:

5.2.3.1 Specific training activities for rural women in technological innovations

Through training and capacity-building workshops, women will gain greater control over resources – material, intellectual and financial – in a context where lack of access to inputs and productive resources is an obstacle to women's self-determination.

The educational approach adopted in local workshops and territorial meetings among women farmers supports a broad environmental education process, seeking connections between feminism, women's rights, the specific conditions of the Caatinga Biome, and agroecological principles. To ensure women's economic autonomy, a fundamental guideline of the project will be the promotion of specific training activities that allow the incorporation of technologies from the pedagogical approach "learn by doing," so that women become adept at using technological innovations in a conscious way and can reproduce them in the local communities. These technical skills in management of equipment and technologies (such as tanks, for example) specifically target the training of women to become multipliers. This approach will be instrumental in changing local attitudes about women's roles in managing local resources and inputs while improving their social status and increasing their income.

5.2.3.2 Actions targeting women in public schools and EFAs

Although diversification is considered a primary principle of agrifood systems⁶ needed in the approach to implementing resilient productive investments by TA teams, it does not necessarily guarantee that families' dietary intake in the coverage area is more varied, since there is often a disconnect between productive practices and consumption habits. In order to help improve the nutritional quality of the families' diets, an action plan will be carried out with women farmers in the context of resilient productive Investments developed in the EFAs and schools.

The proposal is to disseminate information on the value of native plants and foods in local and regional cultures, as well as to encourage the use of new recipes for school meals and establishment of seed banks in public facilities and local communities, targeting women who traditionally take care of food and socio-biodiversity practices in these environments. Workshops at the school and EFAS levels should be replicated by the self-serving women in their local communities, among their families and neighbors, so that changes in eating habits are perceived as a collective issue (within both the family and the community) and not just as an individual problem to be addressed by women as if it were one of their innate functions.

5.2.3.3 Social control and interventions in public policies (PPs)

In the training and social organization processes, it is necessary to take into account the need to guarantee women access to the set of public policies that enable recognition and expansion of their productive activities. Training activities should include examination of information on public policies and women should be encouraged to participate in policy discussions in public meetings in their territories, such as the Municipal Councils for Sustainable Rural Development (CMDRS), in addition to the various bodies, councils and forums of policy articulation and public policy management (including RESAB, regional

⁶ The starting point is the understanding of agrifood systems as inclusive and sustainable processes that encompass social, cultural, economic, environmental and political aspects and consider the connections between production, processing, distribution, and consumption of food product.

education offices, school nutrition councils, among others). Participation of rural women in these public institutions and venues will be closely monitored on the basis of indicators from various domains (social, political, economic, and environmental). Social communication products will be essential inputs to support the performance of women leaders in various PP formulation and monitoring spaces.

5.2.4 Assistance in climate resilient productive systems (CRPS) management highlighting women's protagonism

The methodology to be used for planning and monitoring productive investments should address the demands and desires of all family members so that at least 40% of women and 50% of young people are directly involved. The technicians who carry out the technical assistance must be concerned not only with resolving technical issues but also with advising family or community members and groups on issues related to CRPS management, which requires a methodological approach based on the guiding principles of associativism and cooperativism.

In managing the territorial investment plans in resilience that make up the CRPS, gender considerations are crucial. In this project, technicians will be guided to view the yard around a family's home as a productive space rather than simply an extension of the domestic space (as typically viewed in most programs and projects that provide technical assistance services in Brazil). In the agroecological transition, in which the backyard often plays a central role, some women will become farmer-experimenters, observers and innovators, having appropriated knowledge and technologies, as they pass on their knowledge to other women and also learn from each other. Technicians accompanying these investments will focus on the ways in which changes in agricultural practices trigger processes of growing awareness at the core of social relations.

One of the TA teams' responsibilities in this project is to support CRPS management, which goes beyond financial management of inputs and resources to include organization of work and qualification of productive processes. The starting point for incorporating a gender focus into management processes is the problematization of the sexual division of labor. The processes of assisting and training women's groups and mixed groups in the productive organization should take into account time spent in domestic and care work, seeking to alleviate the burden of reproductive activities through the socialization of these tasks, in addition to use of equipment and other concrete measures related to infrastructure support.

In order to strengthen business management of women's and mixed groups' family and community enterprises, technicians will use tools that help better distribution of work and time, so as to incorporate the household dimension; more significant control over resources and greater transparency in accountability; and the improvement of a system for calculating productive process costs affecting the income obtained from sales. The technical assistance team should recognize the nature of women workload and the weaknesses and strengths that affect their daily routine during visits, meetings, and workshops guided by the basic concepts of associativism and cooperativism.

One line of the PCR that aims to help insert farmers in productive ventures is the provision of investments for microenterprises that provide services and products to guarantee improvements in productive processes that are driving forces of CRPS. Stipulated criteria intend to prioritize the leadership of women, especially young women, in construction of these enterprises. Thus, the inherent capacities of entrepreneurship are stimulated and developed among youth.

5.2.5 Constructing technical assistance services that respond to the demands and needs of rural women

(i) Commercialization

In the field of advisory services for marketing CRPS products, it is vital that TA technicians promote the consolidation of points of sale that go beyond institutional markets, such as agroecological fairs. The short direct circuits favor women's direct interaction with consumers from the sale of socio-biodiverse products without the intermediary action of men, to strengthen women's economic, social and political autonomy. The fairs are already a common event in popular culture, but their scope must be broadened to become a process of political articulation that promotes visibility of specialized products, such as agroecological products. Attention must also be paid to the challenges of focusing on the issue of health legislation and moving toward participatory certification.

The action plan should contain strategies to enable the tracking of productive groups, mixed groups and/or families interested in expanding marketing possibilities, inserting their products in different informal and formal markets. In some cases, it will be important to improve product presentation (packaging, labels, etc.) and plan measures of distribution through communication and marketing strategies. These measures, aimed at quality control and improvement of the product's visual image, will increase the possibilities of placing different agroecological products (*in natura* and processing) in a range of marketing venues.

(ii) Adapted and sustainable technologies

Addressing risks related to climate change requires new information, tools, and technologies, in order to provide subsidies to improve sustainability of agricultural and socio-environmental practices. Effective time-saving technologies and equipment will facilitate accomplishment of agricultural work, especially for women, who usually experience a work overload due to their multiple functions in productive and reproductive tasks and responsibilities.

In this sense, it is worth mentioning the creation of strategies in the "plan of action" that will promote women's engagement in applied technologies and the knowledge management process generated from their use. To this end, there are some questions about the "social" function of technology, since it not only helps generate economic returns and environmental impact but also must answer to the beneficiaries' expectations, positively influencing the quality of their lives and power dynamics underlying social relationships.

From this angle, the approach to introduce social and renewable technologies in CRPS is based on the idea of "learn by doing," since women will be trained in construction and management of technologies such as eco-stoves or gray-water-reuse systems. The goal is for the beneficiary women to become multipliers of practices such as trench barriers and cisterns. Enabling women to coordinate an equipment-building activity (traditionally viewed as a "male" trade) indeed represents a factor in the approach of empowering beneficiary women to hold this position, besides directly shifting gender social relations in the family and community.

5.2.6 Social communication and knowledge management from a gender perspective

Social media and knowledge management strategies need to be combined with educational and organizational processes engaging women to maximize their effects. It is advisable to register and organize innovative and successful experiences of working with gender and women, to facilitate analysis of acquired learning. It is also advisable to integrate an information organizing methodology in the exchanges between CRPS, with significant participation of women, so that these exchanges are conducted with a view toward organization of information as a process, not just a final product.

Methodological tools such as agroecological guidebooks will be essential in the participatory organizing process, significantly enhancing the role of women as experienced farmers in the various agricultural production spaces. The "Agro-ecological Register" aims to record and monitor production, tracking (identifying as sold, donated, exchanged, or consumed) everything that is grown on productive farms and in areas of women's leadership on farms. It will serve as a tool for empowering women, since from this instrument, they see themselves as protagonists in productive processes and begin to become more actively involved in other areas such as marketing or Political Articulation. The register, which will integrate the environmental perspective, will help valorize rural women's productive capacity and assess the economic and environmental impact of productive processes in the areas in which CRPS will be implemented.

Efforts should be made to ensure that the methodologies adopted to organize experiences in the project are integrated into the M&E system. Some levels of changes in social gender relations and empowerment of women farmers from work in CRPS can be measured and serve as input for the qualitative and qualitative indicators of the M&E system. The results should be published (in notebooks and/or videos) at the end of the organizing process and made available to the public and the project's partner organizations, in public spaces and political venues (councils, forums).

5.2.7 Training on gender from a feminist perspective

A gender specialist will be contracted for the purpose of gender-perspective training, but technical teams also need to internalize the perspective of "social inequalities" (gender, race, and ethnicity) and apply it in their interventions. So an effort should be made to provide training to technical teams, especially in the project's initial phase, and reinforcement workshops throughout the implementation cycle. It is important to emphasize the need to "re-educate" contractors to work in communities through an intense training process organized in modules that seek a balance between conceptual deepening and empirical experience from fieldwork.

5.2.8 Strengthening gender management / social control unit in the institutional framework

In addition to implementing strategies that ensure gender mainstreaming in practices with help from gender experts, it is recommended that efforts be made to incorporate gender focus into the project's structures and units. In any social project, it is essential to invest in the strengthening of management units to help mainstream groups and perspectives at the institutional level that have often been classified as "marginalized" (gender, race, and ethnicity). This strategy also supports the work of gender / race / ethnicity advisors, which will be key in the institutional structure at different project levels (in state PMUs and field teams), systematically tracking the actions programmed in the work plan and monitoring changes at local, municipal and regional levels. The commission (which should include technical team members and be open to participation of partner institutions working in these thematic areas) should be an internal space for ongoing reflection, based on organized information on the progress made and obstacles in meeting indicators, besides providing a review of the actions in the diverse stages of the implementation cycle.

This commission also plays a role in the advocacy process. It must link the activities carried out in the framework of the project's work plan with the general trends of the political conjuncture, taking into consideration the impact of actions mapped at the local and regional

levels with negotiation and monitoring of public policies on rural development and environmental sustainability that are gender-based, race-based, and ethnicity-based.

6. GENDER ACTION PLAN: “PLANTING CLIMATE RESILIENCE IN RURAL COMMUNITIES OF THE NORTHEAST” (PCR)

IMPACT STATEMENT:

The project will contribute to increased climate-resilient agricultural production for 1 million direct beneficiaries (of which, at least 40% are women and 50% are youth) of the most vulnerable people, communities and regions in the rural Northeast area of Brazil.

OUTCOME STATEMENT:

Increased resilience to climate change of at least 400,000 women in the project area, through improvement of their capacities to access sustainable forest management, efficient water management, climate smart agriculture, agroforestry practices, food and nutritional security and knowledge management and scaling-up techniques.

Output	Activities	Indicators and targets	Timeline	Responsibilities
Component 1 - Climate Resilient Production systems: implement CRPS, empower beneficiaries to manage sustainably these systems and promote women and youth leadership.				
OUTPUT 1: Territorial Resilience Investment Plans	<ul style="list-style-type: none"> - Guarantee the participation of women (at least 40%) in the stages of design and implementation of TRIPs; ^[1]_{SEP} - Conduct baseline survey on the target population. Information will be disaggregated on gender for knowledge, attitudes and practices (KAP) regarding climate change adaptation in target communities. Studies will include the following gender-transformational 	<ul style="list-style-type: none"> - Studies designed towards identifying families willing to receive investments that contemplate gender issues and gather gender information. - At least 40% of the women in communities involved in developing Territorial Resilience Investment Plans; 	1st and 2 nd year of Project's implementation cycle	Gender specialists; PMU teams; Management Council (made up of representatives of state administration, beneficiaries and civil society); Teams of technicians (for rural technical assistance services)

	dimensions: (i) Access and control over resources (human, social, natural and economic); (ii) Access and control over benefits (monetary and non monetary); (iii) Decision making; (iv) Work load/ division of tasks and responsibilities; (v) Health and well-being (gender violence, social relations, etc).	- 40% of technical assistance team that will implement TRIPs are women.		
OUTPUT 2: Household Resilient Investments	<ul style="list-style-type: none"> - Implementation of productive activities focused on the cultivation of nutritionally-rich foods in backyard gardens and other productive spaces, including native, rustic edible plants that are more resilient in semiarid conditions, many of which tend to depend on the investment of women's time and labour; - Promotion of seed banks" as a mechanism for validating the native knowledge of heirloom seeds, involving women directly in such efforts. 	<ul style="list-style-type: none"> - At least 40% women from families involved in decision making processes concerning the use of resources, inputs and technologies in Household Resilient Investments; -Number of women and their children with significant improvements in their state of health, including a reduction of rates of malnutrition and chronic degenerative diseases. -Number of women directly involved in the preservation and circulation of heirloom seeds within their communities and territories for planting practices. 	2 nd to 6 th year	Gender specialists; PMU teams; Management Council (made up of representatives of state administration, beneficiaries and civil society); Teams of technicians (for rural technical assistance services)
OUTPUT 3: Collective Resilient Investments	- Implementation of productive activities focused on the cultivation of nutritionally-rich foods in	- 40% women (of total of families benefitted in collective resilient investments) participating actively	2 nd to 6 th year	Gender specialists; race and ethnicity consultants; PMU

	<p>productive spaces, including native, rustic edible plants that are more resilient in semi-arid conditions, many of which tend to depend on the investment of women's time and labour;</p> <ul style="list-style-type: none"> - Training sessions for cooks (most of whom are female) in school facilities where CRPS is being taught, aimed at fostering recipes with native crops that originate from the school gardens; - Construction of Collective Resilient Investments with a methodological approach that involves 40% women and 50% youth (of all members of the family) as major protagonists. - Promotion of seed banks" as a mechanism for validating the native knowledge of heirloom seeds, involving women directly in such efforts. 	<p>in the sustainable management of natural resources within collective areas;</p> <ul style="list-style-type: none"> - 40% of income-generating and resilient production-based activities in collective areas made up of female agricultural workers; - 40% of students involved in CRPS training are girls; -Number of women (Cooks; Professors; students) sensitized for disseminating climate-resilient agricultural and food practices in schools and Family-based agriculture centers (EFAS); -Number of women directly involved in the preservation and circulation of heirloom seeds within their communities and territories for planting practices. 		<p>teams; Management Council (made up of representatives of state administration, beneficiaries and civil society); Teams of technicians (for rural technical assistance services)</p>
OUTPUT 4: Farmers and Entrepreneurship Support	<ul style="list-style-type: none"> - At least 40% of agricultural workers participating in Interactive activities such as exchanges and work team efforts for 	<ul style="list-style-type: none"> -Number of women selected and trained in productive practices and/or technologies. 	2 nd to 6 th year	<p>Members of the "farmers network"; technical service providers; Gender specialists; PMU</p>

	<p>implementation of sustainable technologies should be women;</p> <p>- Create gender-transformational training programs with 550 technical service providers and farmers identified as “local talents”;</p> <p>- Consolidate a participatory CRPS monitoring methodology to be carried out by the farmers network in coordination with technical assistance teams that contains at least 2 indicators focused on qualitative transformations in gender roles and relations within socio-environmental processes.</p>	<p>-550 technical service providers and farmers identified as “local talents” sensitized in gender roles, dynamics and relations within the field of climate change and environmental sustainability;</p> <p>-Number of socio-environmental indicators that register and monitor transformations in gender roles and relations within diverse productive spaces.</p>		teams
	<p>- Promotion of entrepreneurship in CRPS among young female farmers;</p>	<p>- At least 40% of rural micro-enterprises developed under young women’s leadership;</p>	2 nd to 6 th year	PMU teams; Gender specialists; technical assistance teams
Component 2: WATER ACCESS - disseminate practices to capture, harvest, store and use efficiently water to decrease the vulnerability of livestock and crops to rainfall irregularity and prolonged droughts.				
OUTPUT 5: Water access technologies for harvesting, reuse, treatment and storage	<p>-Foster women’s participation in the construction and replication of technologies such as cisterns, rainwater reservoirs, trenches and small underground dams;</p> <p>-Promote workshops and visits to</p>	<p>- Number of women (40% of the families involved) benefitted by rainwater harvest and storage techniques;</p> <p>- Number of women trained in technologies dedicated towards the</p>	2 nd to 6 th year	Technical service providers; Gender specialists; PMU teams

	improve farmers' knowledge in water harvesting and storage technologies with at least 40% women's participation.	capture and storage of rainwater who act as local and regional "multipliers."		
	- Foster training sessions focused on the re-use of grey and black water in family residences among local female farmers;	- Number of training sessions with at least 40% of female participants;	2 nd to 6 th year	Technical service providers; Gender specialists; PMU teams
Component 3: Knowledge management and Scaling-up - strategies for capacity- building; learning, exchange and replication of sustainable practices and qualifying inputs for public policy making				
OUTPUT 6: Capacity and awareness building	<ul style="list-style-type: none"> - Promote affirmative actions (women-only events, workshops and training sessions); - Foster alternatives for childcare support and socialization of domestic activities; - Hold sensitivity training sessions for technical assistance providers in gender, race and ethnicity approaches; - Compilation of case studies with focus on gender issues, especially within the context of traditional communities; - Register and systematize knowledge-sharing of sustainable 	<ul style="list-style-type: none"> - At least 165 of 414 young communicators are young women; - 200 sustainable technologies and methodological innovations registered, 40% of which have been implemented under female leadership; - 40% of women involved directly in training and replication of 540 eco-sufficient stoves and 540 bio-digesters; - Use of at least 5 different social media resources and techniques for capturing technological and methodological innovations; - 550 technical service providers 	1st to 6 th year	PMU teams; gender specialists; social communication specialists/ consultants; technical assistance teams; Farmers Network ("Local talents")

	<p>technologies by female farmers and youth leaders;</p> <ul style="list-style-type: none"> - Foster the creation of a young communicators' network, 40% of whose members are female; - Promote trainings, workshops and inter-regional, inter-state exchange visits between youth communicators, 40% of whom are women; - Contribute towards the diversification of social media resources and techniques for registering methodological and technological innovations. 	<p>and local talents (farmer leaders) using methodological approaches with gender, race and ethnicity focus;</p> <ul style="list-style-type: none"> - Childcare support activities carried out in 80% of the total of 699 events promoted; - Up to 200 women's groups and grassroots organizations created as a result of affirmative-action activities. 		
OUTPUT 7: Scaling-up and Sharing	<ul style="list-style-type: none"> - Guarantee women's participation (at least 40%) in 5 learning routes in Brazil, at the level of Latin America and Caribe (LAC) and Africa; - Design and implement a methodological approach to learning routes and exchanges within Brazil and internationally that features women as main protagonists and disseminators of knowledge; - Produce thematic studies and publications that feature women-led 	<ul style="list-style-type: none"> - Number of learning routes (national and international) that include visits to experiences led by women; - 40% of women included in learning routes and exchanges (technical service providers and female community leaders); - 50% of systematizations that compose 8 thematic studies featuring women-led initiatives; 	1 st to the 8 th year	<p>Social communication specialists/ consultants; M & A consultants; Gender specialists; CPMU (BNDES team); Management Council</p>

	<p>initiatives in the construction of resilient and sustainable productive systems;</p> <p>- Ensure the dissemination of proposals for climate change resilience with a gender focus in relevant channels of information.</p>	<p>- 50% of outcomes and learning initiatives published as part of Knowledge and Results Management component should feature women-led experiences;</p> <p>- 40% of 70 newsletters and informative reports produced feature women as protagonists in climate resilient productive systems and contain proposals / recommendations for incorporating a gender focus in climate change resilience strategies;</p> <p>- 60% of project beneficiaries (men and women) receiving news about measures and strategies for resilience in the face of climate change via particular information channels.</p>		
OUTPUT 8: Planning, Knowledge Management and M&E	<p>- Develop a monitoring system that will use disaggregated data, as well as indicators of progress in gender and racial/ethnic dimensions;</p> <p>- Hold meetings to evaluate project results using as a reference at least 4 indicators with a gender focus;</p> <p>- Carry out seminars with</p>	<p>- Number of indicators of progress in monitoring system that contemplate gender, racial/ethnic dimensions;</p> <p>- Number of technical progress reports (TPRs) that incorporate a gender analysis;</p> <p>- 40% of participants of meetings</p>	1 st to the 8 th year	<p>Social communication specialists/ consultants; M & A consultants; Gender specialists; CPMU (BNDES team); Management Council</p>

	<p>representation of community leaders (40% of whom are women) at the beginning, middle and finalization of project implementation to evaluate project results and impacts;</p> <p>- Develop a participatory and qualitative monitoring methodology of TRIPs involving youth communicators, 40% of whom should be women;</p> <p>- Construction of guidelines and reference schemes for thematic systematizations with gender, racial and ethnic focus.</p>	<p>and seminars for evaluation and monitoring are female beneficiaries.</p> <p>- At least three thematic systematizations throughout the project execution period that emphasize immediate impacts on households in terms of income and food security in short to medium term with a gender, racial/ethnic focus.</p>		
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Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex: Appendix 3. Working Paper 3 Ghg Apraisal Report Pcr 060420

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department



Food and Agriculture Organization
of the United Nations



Enabling poor rural people
to overcome poverty

Brazil

Greenhouse gas appraisal report for the joint IFAD-GCF project “Planting climate resilience in rural communities of the Northeast (PCR)” in Brazil

05 February 2020

Rome, Italy

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Acknowledgments

This report was prepared by Philip Audebert, Economist (Agricultural Policies and Climate Change), FAO, in close collaboration with René Castro and Sébastien Subsol from IFAD. The report was reviewed by Jihae Kwon, Economist (Agricultural Policies and Climate Change), FAO and Laure-Sophie Schiettecatte, Economist (EX-ACT team leader), FAO for the joint IFAD-GCF project “Planting climate resilience in rural communities of the Northeast (PCR)” in Brazil.

Executive summary

The joint IFAD-GCF project “Planting climate resilience in rural communities of the Northeast (PCR)” in Brazil has the objective to “transform family farmers’ productive systems in the semiarid by increasing production while simultaneously improving their capacity to face the challenges posed by ongoing climate change.” The project will take place in the Semiarid region of Northeast Brazil (NEB). The PCR is co-funded by GCF and IFAD, with a total financing capacity of USD 202 500 755.

The project is currently under design and will have an implementation period of 8 years and a capitalization phase of 12 years. The total lifespan of the project is 20 years. For this report, EX-ACT version 8.5 was used and the total carbon balance of the project ranges between -11 315 106 tCO₂eq and -11 851 807 tCO₂eq over the 20 years period.

Project information

The project “Planting climate resilience in rural communities of the Northeast (PCR)” of Brazil¹, is still under design at the time of this greenhouse gas (GHG) appraisal, and is expected to be implemented end of 2020 or early 2021 over an eight years period.

The Programme Development Objective (PDO) is to “transform family farmers’ productive systems in the semiarid by increasing production while simultaneously improving their capacity to face the challenges posed by ongoing climate change.” The PCR project is co-funded by Green Climate Fund (GCF) and IFAD, with a total financing capacity of USD 202 500 000.

Table with the contributions of each institutions

Table 1. Project budget and share among the institutions

Funding source(s)	Amount (in USD)
International Fund for Agricultural Development (IFAD)	30,000,000
Green Climate Fund (GCF)	99,500,000
Brazilian Development Bank (BNDES)	73,000,000

Project components and activities

The project’s objective is to “transform family farmers’ productive systems in the semiarid by increasing production while simultaneously improving their capacity to face the challenges posed by ongoing climate change.” This will be achieved through three different components:

Component #1 [Budget: USD 67 478 662] aims to implement Climate Resilient Productive System (CRPS), empower beneficiaries to manage sustainably these systems and promote women and youth leadership. Investment strategies are designed to meet diverse demands of family farmers given various land areas sizes, climate-resilience adaptation requirements, target beneficiaries and productive objectives.

Component#2 [Budget: USD 101 803 245] seeks to disseminate practices to capture, harvest, store and use efficiently water to decrease the vulnerability of livestock and crops to rainfall irregularity and prolonged droughts. Beneficiaries will pay attention to addressing issues of efficient water management, good irrigation practices, and techniques for limiting evapotranspiration, and precautions to avoid soil salinization. All pumping systems will use renewable energy, either photovoltaic or wind.

Component#3 [Budget: USD 9 432 678] will support and amplify activities deployed in from the previous components. It will explore for the scaling up and sharing of information through the South-South Cooperation (SSC), the unlocking of policy barriers and the experimentation of the participatory monitoring model (CRPS).

Project Management [Budget: USD 14 786 170]

Project site

Caatinga is a semiarid region in the Northeast of Brazil covering a total population of 27 million people.² The IFAD project “Planting climate resilience in rural communities of the Northeast (PCR)” is tackling a number of sites in the region. The exact locations of the project area are yet to be defined. The project targets a total of 250 000 households in this region.

The average minimum and maximum temperature of the Caatinga region is 21.2°C and 30.5°C, respectively (European Centre for Medium-Range Weather Forecasts 2016). The average annual precipitation for the region is 722 mm per year (Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS v2) 2017). In consequence, the Caatinga qualifies for a **tropical dry climate**.

According to the joint UNESCO-FAO soil maps (*see Annex 1*), the area is dominated by five types of soils, namely in descending order Chromic Luvisols, Ferric Luvisols, Orthic Acrisols, Ferrenic Arenosols and Lithosols. These soils can be reclassified according to IPCC’s soil classification of 2019: in descending order high activity clay³, (HAC

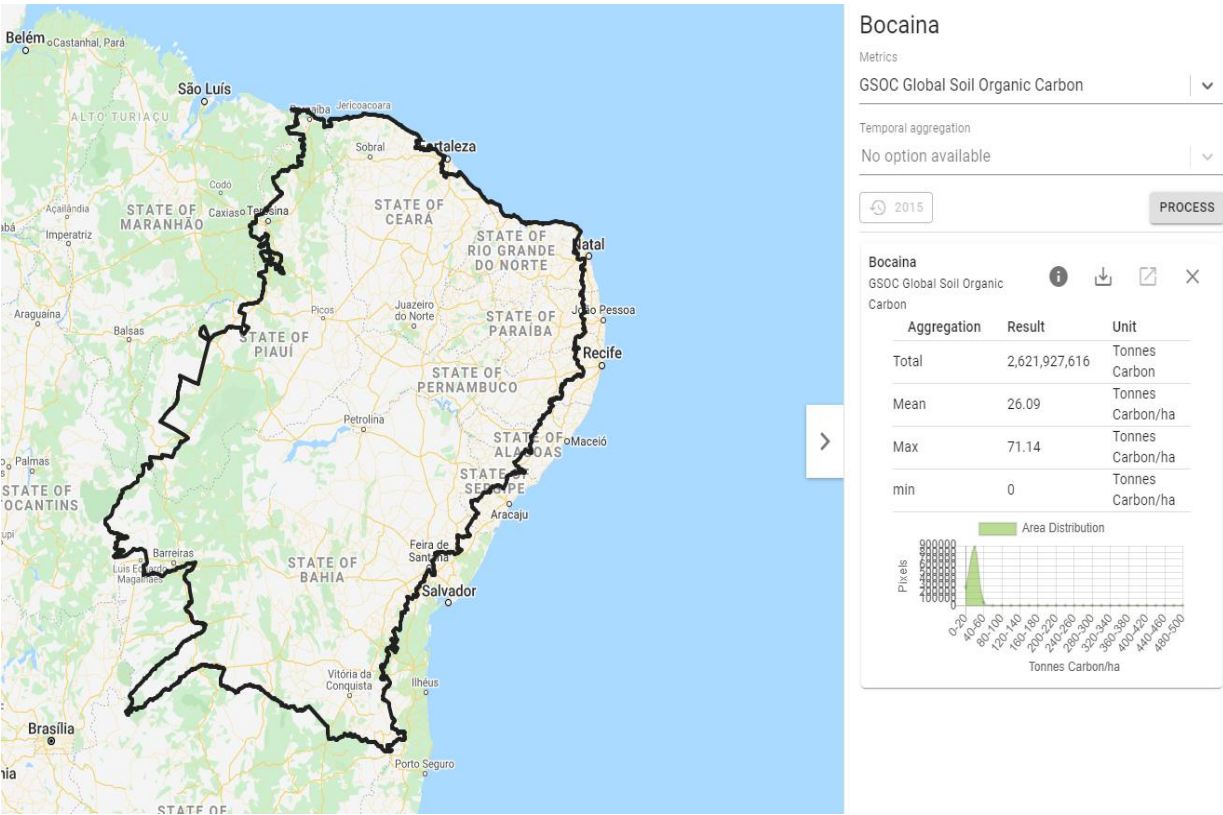
¹ Project ID 2000002253

² Ministry of Integration webpage, available at: <http://www.integracao.gov.br/semiario-brasileiro>

³ HAC soils have appreciable amounts of high-activity clays (e.g. 2:1 layer clays) that promote long-term stabilisation of organic matter, especially in many carbon-rich temperate soils. In contrast, LAC soils (e.g. ferrenic arenosols) have

comprising chromic luvisols, ferric luvisols), sandy soils (orthic acrisols), low activity clay (LAC comprising ferrenic arenosols) and undefined soils (lithosols). TIER 2 values for the soil organic carbon were applied using FAO’s Global Soil Organic Carbon Map (with an average soil organic carbon of 26.09), Figure 1.

Figure 1. Project sites and Global Soil Organic Carbon content in the semiarid region of Northeast Brazil.



Source: FAO, 2020.

a much lower ability to stabilise carbon, and respond more rapidly to changes in the soil’s carbon balance, and include highly-weathered acid soils.

Climate mitigation impact

The EX-Ante Carbon-balance Tool

The Ex-Ante Carbon-balance Tool (EX-ACT) is an appraisal system developed by FAO providing estimates of the impact of agriculture, forestry and fishery development projects, programmes and policies on the carbon-balance. The carbon-balance is defined as the net balance of all GHGs, expressed in carbon dioxide equivalents (CO₂eq), that were emitted or sequestered due to project implementation as compared to a business-as-usual scenario. EX-ACT is a land-based accounting system, estimating carbon stock changes (i.e. emissions or sinks of CO₂) as well as GHG emissions per unit of land, expressed in equivalent tonnes of CO₂ per hectare and year. The tool helps project designers to estimate and prioritize project activities with the greatest economic benefit and potential for climate change mitigation. This GHG mitigation potential may also be used for economic analyses and for allocating additional project funds.

Data used for the EX-ACT analysis

Agro-ecological variables

The PCR is expected to affect 84 124 ha covering forest lands, annual croplands, perennial croplands and grasslands. The project area is characterized by a tropical climate with a dry moisture regime. While the project will be implemented about a period of 8 years, EX-ACT will account in addition for a 12 year period of capitalization, which is needed in order to capture the full impact of management and conservation strategies on biomass and soil carbon stocks⁴.

A sensitivity analysis was run given the wide diversity of soil. A lower bound analysis is taking into account a region defined with sandy soil, while HAC soil was used in the higher bound analysis.

Activity Data for the GHG appraisal

The main activities with a GHG impact are within component 1 of the project and presented here below, Table 2.

Table 2. Main project components for the GHG appraisal

Project components	Project activities	Without the implementation of the project ⁵	With the implementation of the project
Component 1:	Sustainable land management	No improvements	84 124 ha will be sustainably managed
	Eco-stoves installations	No installations	540 eco-stoves installed
	Biodigester installations	No installations	540 biodigestors installed

Two analysis have been conducted, one taking into account the optimistic scenario with an increased afforestation on degraded grasslands. Assumptions taken for each are described in the next two sections.

Assumptions associated with the activity data for the pessimistic scenario

The sustainable land management can be broken down in following components:

1. 36 000 ha of Caatinga dry forests (24 percent), shrubs (47 percent) and grasslands (28 percent)⁶ will be improved through:
 - (1) afforestation of shrubs and dry forests on 5 percent of currently degraded grasslands,
 - (2) the introduction of live fences, pasture rotation and silage on the 95 percent of remaining grasslands,

⁴ The 20 years period (accounting duration) is in line with the idea that even after the point at which a new equilibrium in land use and practices is reached at the end of the implementation phase, further changes may occur as the result of the preceding interventions. For instance, for the soil C estimates, the default values are based on default references for soil organic C (SOC) stocks for mineral soils to a depth of 30 cm (Table 2.3 of IPCC 2006). When SOC changes over time (land use change or management change), it is assumed a default time period for transition between an equilibrium of 20 years. These values are used either in IPCC 1996 or 2006 Guidelines and are gathered from a large compilation of observations and long-term monitoring.

⁵ Also named baseline scenario

⁶ For a detailed description of the land cover shares, please refer to the Annex and the EX-ACT assessments.

- (3) an improved management of shrubs and dry forests through live fences.
2. 24 062 ha of Baja-caatinga pastures with declining productivity will be converted into silvopastoral systems (agroforestry).
3. Mono-culture crops will be converted into climate resilient production systems with multiple crops (alley cropping).
4. The installation of 540 biodigestors, together with the installation of 540 eco-stoves and 31 000 solar pumps (the solar pumps were not accounted for in the GHG calculation).
5. Currently, there are 3,750,000 goats present in the project area. This corresponds to the average number of goats by household in the region multiplied by the number of households targeted by the project (250,000). This number is not expected to change in the future with and without the project.

Assumptions associated with the activity data for the optimistic scenario

The sustainable land management can be broken down in following components:

1. 36 000 ha of Caatinga dry forests (24 percent), shrubs (47 percent) and grasslands (28 percent) will be improved through:
 - (1) afforestation of shrubs and dry forests on 10 percent of currently degraded grasslands,
 - (2) the introduction of live fences, pasture rotation and silage on the 90 percent of remaining grasslands,
 - (3) an improved management of shrubs and dry forests through live fences.
2. 24 062 ha of Baja-caatinga pastures with declining productivity will be converted into silvopastoral systems (agroforestry).
3. Mono-culture crops will be converted into climate resilient production systems with multiple crops (alley cropping).
4. The installation of 540 biodigestors, together with the installation of 540 eco-stoves and 31 000 solar pumps (the solar pumps were not accounted for in the GHG calculation).
5. Currently, there are 3,750,000 goats present in the project area. This corresponds to the average number of goats by household in the region multiplied by the number of households targeted by the project (250,000). This number is not expected to change in the future with and without the project.

GHG appraisal results

All calculations done in the EX-ACT tool are reported in the results module. After a short reminder of the description module (name of the appraised project, its duration, the continent, the dominant climate, and the soil chosen by the user) including the total area of the project, the following table summarizes the GHGs sequestration and the share of the balance per GHG from the adopted scenario (Figure 3). The balance is the difference of GHG gross fluxes between the with-project situation and the without project situation. Results are given tCO₂eq. Positive numbers represent sources of CO₂eq emissions while negative numbers represent sinks. The left table section summarizes estimated gross fluxes and CO₂eq emissions and sinks from the scenario without-project (left column), from the scenario with-project (middle column) and the total balance (right column). The middle table details the carbon-balance under project implementation, showing the GHG fluxes from the different modules. The right table details annual CO₂eq fluxes for the different activities without and with-project implementation, and for the carbon-balance.

The carbon-balance of the project, which consists in the difference of tCO₂eq emitted or sequestered between a scenario with project and a scenario business-as-usual (BAU or baseline scenario), demonstrates the benefits of implementing the project and its different components in terms of mitigation potential.

The right table describes the carbon balance of each project activity. It covers the activities deployed in the project, which comprise a better forest management, the conversion of annual systems into agroforestry system and some afforestation on degraded lands.

Overall the carbon balance ranges from -11 315 106 to -11 851 807 tCO₂eq over the 20-years period according to the sensitivity analysis.

In the **“pessimistic” project scenario** GHG mitigation scenario, the accumulated GHG mitigation potential due to project implementation amounts to -6.7 tCO₂eq per hectare per year, or about -11.3 million tCO₂eq over the entire 20-years-period of analysis.

In the **“optimistic” project scenario** GHG mitigation scenario, the accumulated GHG mitigation potential due to project implementation amounts to -7.0 tCO₂eq per hectare per year, or about -11.9 million tCO₂eq over the entire 20-years-period of analysis.

Figure 3. EX-ACT Results for the pessimistic project scenario

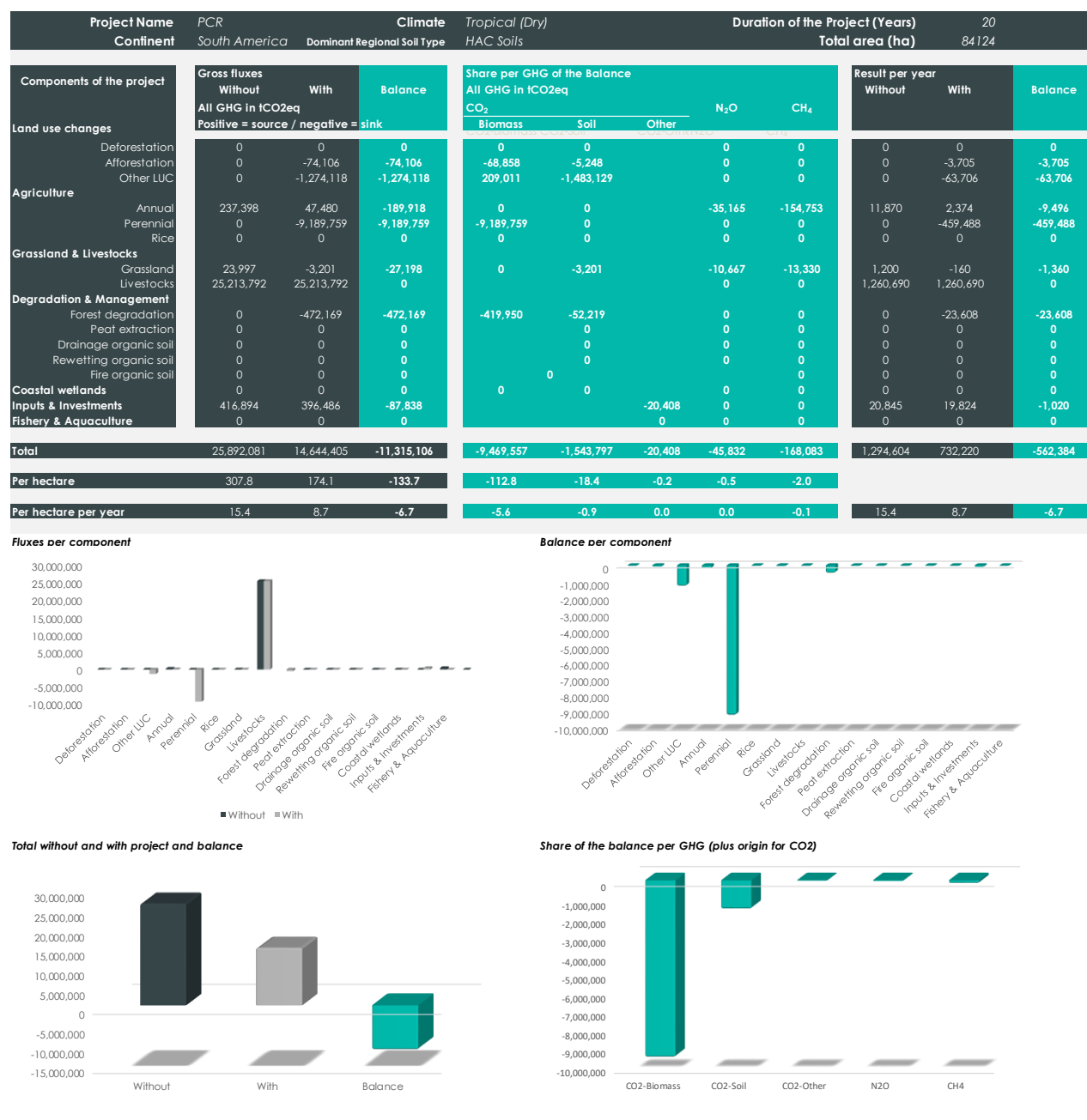
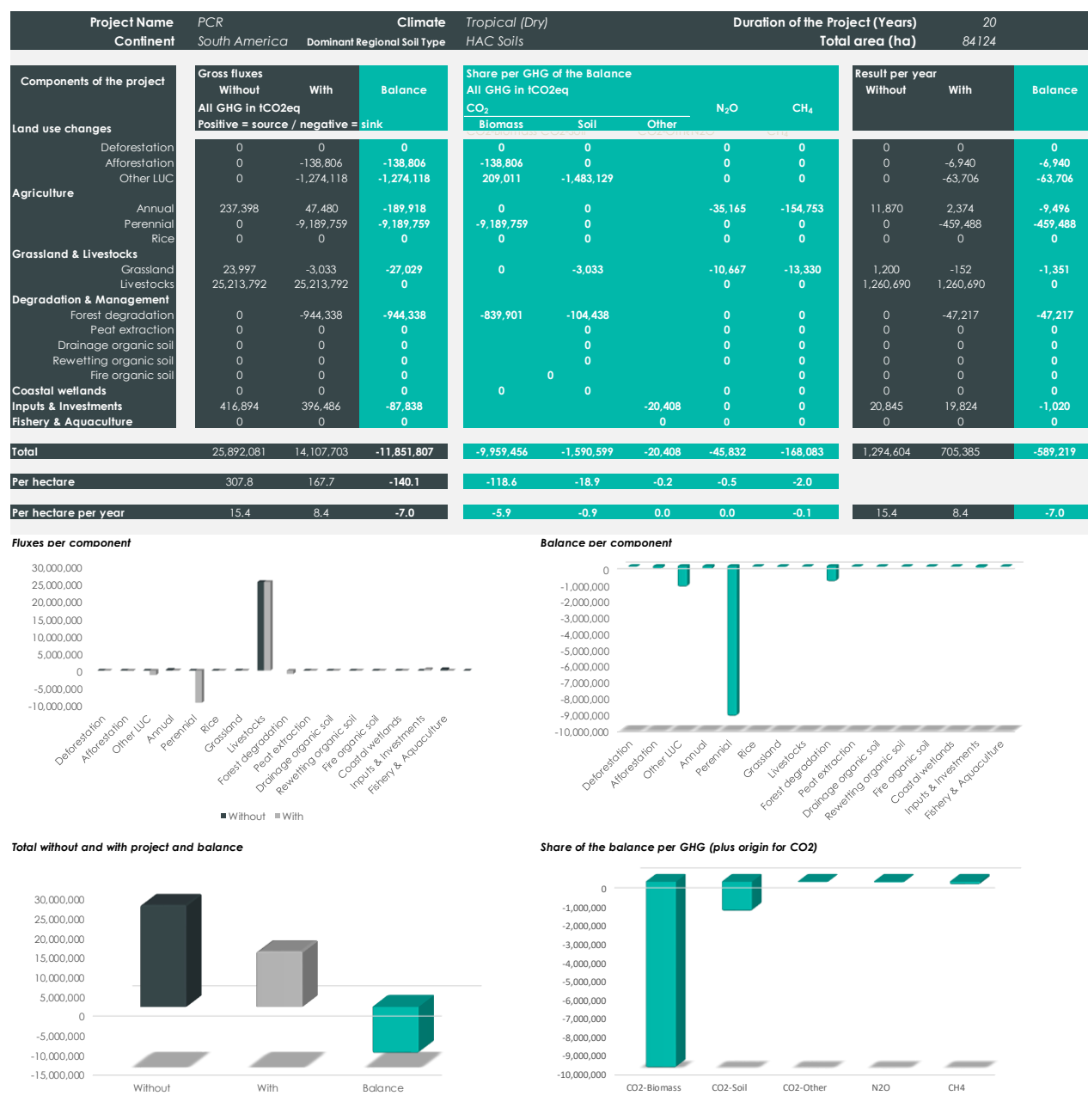


Figure 3. EX-ACT Results for the optimistic project scenario



Uncertainty assessment

The overall uncertainty is estimated at 47.3 percent and 46.8 percent for the pessimistic and optimistic scenarios, respectively. Such uncertainties are rather common in GHG appraisals for the AFOLU sector as emission processes are very sensitive to environmental conditions (notably the climate and soils) and furthermore hard to model accurately (Gibbons *et al.*, 2006; Rypdal and Winiwarer, 2001). These high emission level uncertainties indicate potential for improvements and, consequently, the need for recalculations including the use of Tier 2 values for carbon stocks in the biomass.

Conclusion and recommendations

The total budget spent on Component 1 amounts to USD 73 282 484⁷, while the total budget of the PCR amounts to USD 202 500 755. Considering only the budget spent on the implementation of Component 1⁸, the investment amounts to 6.18 to 6.48 USD per tCO₂eq. Considering the total budget of the PCR, the investment amounts to 17.09 to 17.90 USD per tCO₂eq.

The GHG assessment is based to large extents on refined TIER 1 values (from Cardinael et al., 2018 and IPCC 2006 and 2019). Yet, emission reductions due to the installation of solar panels were not considered in this appraisal. This should be accounted for in a next GHG appraisal of this project.

⁷ For a detailed description of the budget under Component 1, please refer to Annex 7.2.

⁸ All activities impacting the carbon-balance are to be found under Component 1.

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Annexes

Detailed assumptions

Table 3. Detailed assumptions for the optimistic scenario.

	Category	Business as usual scenario	Project scenario	Area in ha
1	LUC	Currently 36 000 ha are exclusively used as Caatinga dry forests (28%), shrubs (47%) and grasslands (24%), see proportionate land cover table (2) in Land cover Caatinga. This area is heavily affected by goat grazing, i.e. severely degraded pasture-, wood- and shrublands (IFAD personal communication).	Afforestation of shrubs and dry forests on 10% of degraded grasslands. The shrubs and dry forests will be afforested proportionately to their current presence on the 36 000 ha, i.e. 62% shrubs and 38% dry forests (see proportionate land cover table (2) in Land cover Caatinga).	871
	Grassland		<p>Live fences, pasture rotation and silage will be introduced on the remaining 90% of grasslands to limit goat grazing and improve grasslands.</p> <p>Non-degraded soil carbon stocks (SOC) in the region are about 26.09 tC/ha (SOC value retrieved from Earthmap, FAO 2020).</p> <p>As a straightforward approach we considered the percentage difference the different grazing intensity as reported by Schulz et al 2016, see table SOC grassland in land cover Caatinga sheet.</p>	7 836
	Forest management		The introduction of live fences will also reduce the level of biomass lost of shrubs and dry forests with a large degradation level by 10% (to a moderate degradation level).	27 293
2	LUC	Degraded Grasslands	Baja-caatinga pastures with declining productivity will be converted into silvopasture agroforestry systems (defined as "Woody species planted on permanent grasslands, often grazed"), where slash and burn will also cease.	24 062

3	Cropland	Mono-culture crops with residue burning	<p>Mono-culture crops will be converted into Climate Resilient Production Systems with multiple crops (pg.8 of FP).</p> <p>Under the CRPS, following practices will be undertaken: (i) Soil Preparation: Maintenance of dispersed trees, setting up cradles and natural fertilization; (ii) Soil Protection: Soil cover and biomass production with resilient plant varieties, (iii) Water management: capture and storage (both in soil and vegetation), level curves and terraces; (iv) Planting: Stratification, diversification and densification with herbaceous, shrub and tree species maximizing photosynthetic capacity; (v) Management: Active pruning and thinning. (vi) residues are no longer burnt</p>	24 062
4	Livestock	Livestock number is estimated at 3 750 000 goats.	Livestock number is estimated at 3 750 000 goats.	N/A
5	Inputs	No additional inputs	540 biodigestors, 540 eco-efficient stoves and 31 000 Solar pumps (yet those solar pumps were not accounted for as no information was available for the time being). Currently 4 t of compost is applied on agricultural fields and these practices are expected to be continued.	N/A
6	Inputs	Compost estimated at 4 kg per ha on degraded grasslands (under 2) and mono-culture crops (under 3)	Same amount of compost will be applied to the agroforestry systems.	N/A

Table 4. Detailed assumptions for the pessimistic scenario.

	Category	Current	Project scenario	Area in ha
1	LUC	Currently 36 000 ha are exclusively used as Caatinga dry forests (28%), shrubs (47%) and grasslands (24%), see proportionate land cover table (2) in Land cover	Afforestation of shrubs and dry forests on 5% of degraded grasslands. The shrubs and dry forests will be afforested proportionately to their current presence on the 36 000 ha, i.e. 62% shrubs and 38% dry forests (see <i>proportionate land cover table (2) in Land cover Caatinga</i>).	435
	Grassland	Caatinga. This area is heavily affected by goat grazing, i.e. severely degraded pasture-, wood- and shrublands (IFAD personal communication).	Live fences, pasture rotation and silage will be introduced on the remaining 95% of grasslands to limit goat grazing and improve grasslands. Non-degraded soil carbon stocks (SOC) in the region are about 26.09 tC/ha (SOC value retrieved from Earthmap, FAO 2020). As a straightforward approach we considered the percentage difference the different grazing intensity as reported by Schulz et al 2016, see table SOC grassland in land cover Caatinga sheet.	8272
	Forest management		The introduction of live fences will also reduce the level of biomass lost of shrubs and dry forests with a large degradation level by 5% (to a moderate degradation level).	27 293
2	LUC	Degraded Grasslands	Baja-caatinga pastures with declining productivity will be converted into Silvopasture agroforestry systems (defined as "Woody species planted on permanent grasslands, often grazed"), where slash and burn will also cease.	24 062
3	Cropland	Mono-culture crops with residue burning	Mono-culture crops will be converted into Climate Resilient Production Systems with multiple crops (pg.8 of FP). Under the CRPS, following practices will be undertaken: (i) Soil Preparation: Maintenance of dispersed trees, setting up cradles and natural fertilization; (ii) Soil Protection: Soil cover and biomass production with resilient plant varieties, (iii) Water management: capture and storage (both in soil and vegetation), level curves and terraces; (iv) Planting: Stratification, diversification and densification with herbaceous, shrub and tree species maximizing photosynthetic capacity; (v) Management: Active pruning and thinning. (vi) residues are no longer burnt	24 062

4	Livestock	Livestock number is estimated at 3 750 000 goats.	Livestock number is estimated at 3 750 000 goats.	N/A
5	Inputs	No additional inputs	540 biodigestors, 540 eco-efficient stoves and 31 000 Solar pumps (yet those solar pumps were not accounted for as no information was available for the time being). Currently 4 t of compost is applied on agricultural fields and these practices are expected to be continued.	N/A
6	Inputs	Compost estimated at 4 kg per ha on degraded grasslands (under 2) and mono-culture crops (under 3)	Same amount of compost will be applied to the agroforestry systems	N/A

Budget of Component 1

Component	Output	Activity	Total (USD)
Component 1. Climate Resilient Productive Systems (CRPS)	1.2.Household Resilient Investments		28,341,128
		Activity 1.2.1 Implement CRPS in family farms	3,398,666
			14,400,774
		Activity 1.2.2 Implement backyard gardens using CRPS	15,677,679
			459,486
			404,348
	1.3 Collective resilient investments	Activity 1.3.1 Implement Collective Areas Sustainable Management (CASM)	5,155,541
			679,816
			3,674,919
		Activity 1.3.2 Implement CRPS in Schools	58,911
			268,371
		Activity 1.3.3 Test productive models of Bio saline agriculture	49,745
	713,101		
Total			73,282,484

Additional notes on GHG accounting

In order to account for the GHG reduction benefits of biodigestors and eco-stoves, additional calculations had to be made that are not yet part of the EX-ACT tool. In particular, both biodigestors and eco-stoves will lead to a reduction of annual carbon losses in biomass of fuelwood removal and a reduction of the emissions for the combustion of woody biomass. Biodigestors furthermore reduce manure methane emissions by converting the manure to biogas.

Combustion of woody biomass

The GHG emissions from the combustion of woody biomass is estimated as the following, Equation 1:

$$\text{Emissions}_{\text{Woody biomass combustion}} = Q \times D \times (CF_{CH_4} \times EF_{CH_4} + CF_{N_2O} \times EF_{N_2O})$$

where Q is the quantity of wood consumed in tonnes, D is the wood density in oven-dry tonnes per moist m³ and CF_{CH₄} and CF_{N₂O} oxide are the combustion factors for CH₄ and N₂O and EF_{CH₄} and EF_{N₂O} are the emission factors of Methane and Nitrous oxide based on their global warming potential (Hingane, 1991 and IPCC, 2006).

Annual carbon loss in biomass of fuelwood removal

$$L_{\text{Fuelwood}} = [\{FG_{\text{trees}} \times BCEF_R \times (1 + R)\} + FG_{\text{part}} \times D] \times CF$$

where L_{fuelwood} is the annual carbon loss due to fuelwood removals in tonnes C per year, FG_{trees} is the annual volume of fuelwood removal of whole trees in m³ per year, FG_{part} is the annual volume of fuelwood removal as tree parts, m³ per year, R is the ratio of below-ground biomass to above-ground biomass, in tonne d.m. below-ground biomass (tonne d.m. above-ground biomass)⁻¹; R must be set to zero if assuming no changes of below-ground biomass allocation patterns, CF is the carbon fraction of dry matter, tonne C (tonne d.m.)⁻¹, D is the basic wood density, tonnes d.m. m⁻³, BCEFR is the biomass conversion and expansion factor for conversion of removals in merchantable volume to biomass removals (including bark), tonnes biomass removal (m³ of removals)⁻¹ and CF is the conversion factor m³ biomass to t biomass (1.38m³/t) for fuelwood (IPCC, 2006).

Eco-efficient stoves emission reductions

The emissions reductions due to the installation of eco-stoves, R_{eco-stove combustion}, is estimated from the following equation:

$$R_{\text{eco-stove combustion}} = \text{Emissions}_{\text{Woody biomass combustion}} - \text{Emissions}_{\text{Woody biomass combustion reductions}} \times N \times S$$

Where:

- Emissions_{Woody biomass combustion} is the total emissions due to the combustion of woody biomass as defined in 7.3.1;
- Emissions_{Woody biomass combustion reductions} is the emission reduction of combustion of woody biomass only for the quantity of households with eco-stoves;
- N is the number of biodigestors, and
- S is the energy saving potential due to the improved energy efficiency of the stoves;

With R_{eco-stove fuelwood removal} estimated as the following:

$$R_{\text{eco-stove fuelwood removal}} = L_{\text{Fuelwood removal}} - L_{\text{Fuelwood removal reductions}} \times N \times S$$

Where:

- L_{Fuelwood removal} is the total annual carbon loss due to fuelwood removals in tonnes C per year and,
- L_{Fuelwood removal reductions} is the emission reduction of combustion of woody biomass only for the quantity of households with eco-stoves (IPCC, 2006 and Regueira, 2010).

Total manure emission reductions

$$CH4_{\text{manure}} = EF_{\text{manure}} \times GWP \times N/1000 - CH4_{\text{manure reduction biodigester}}$$

where $CH4_{\text{manure}}$ is the methane emission factor by average annual temperature, N is the number of heads and $CH4_{\text{manure reduction biodigester}}$ is the manure methane emission reductions by the biodigestors (IPCC, 2016 and Santiago, 2013).

$$CH4_{\text{manure reduction biodigester}} = D_{CH4} \times EF_{CH4} \times f_{\text{manure}} \times SV \times T \times B$$

where D is the methane density, f_{manure} is the transformation conversion factor defined by the US EPA (2008), SV are the volatile solids per day, T is the time and B is the maximum production capacity depending on the manure type (Winsock, 2008).

Biodigester emissions

The biodigester converts the manure in biogas, which is composed mainly of methane. For this analysis, a biodigester system was subdivided into two main subsystems:

- i) an internal chamber which creates an anaerobic fermentation process
- ii) an external chamber which creates a semi-aerobic fermentation process

For the external chamber, a methane leakage fraction was assumed. To estimate the GHG emissions of biodigestors, following equations were established:

- iii) an internal chamber which creates an anaerobic fermentation process

$$\text{Emissions}_{\text{internal chamber}} = D_{CH4} \times EF_{CH4} \times f_{\text{anaerobic}} \times SV \times T \times B \times \left(\frac{CE_h}{100}\right) \times \left(1 - \frac{ED}{100}\right)$$

where $\text{Emissions}_{\text{internal chamber}}$ are the methane emissions of the internal chamber of the biodigester, f_{internal} is the transformation conversion factor of biodigester's internal chamber, CE_h is the collection efficiency relative to the internal membrane and the external supernatant and ED is the Methane Destruction Efficiency of Natural Gas (IPCC, 2006 and Santiago, 2013).

- iv) an external chamber which creates a semi-aerobic fermentation process

$$\text{Emissions}_{\text{external}} = D_{CH4} \times EF_{CH4} \times f_{\text{semi-aerobic}} \times SV \times T \times B \times (1 - CE_h)$$

where $\text{Emissions}_{\text{external}}$ are the methane emissions of the internal chamber of the biodigester and $f_{\text{semi-aerobic}}$ is the transformation conversion factor of biodigester's external chamber.

For more information on the calculations and the references, please refer to the attached EX-ACT calculations.

EX-ANTE CARBON-BALANCE TOOL [EX-ACT]

Mainstreaming greenhouse gas accounting into agricultural investments and policies

The 2030 Agenda and Paris Agreement tied the knot between sustainable economic development and a climate-resilient, low greenhouse gas (GHG) emissions future. Moving forward, accounting for potential changes in GHG emissions will be a vital component of any agricultural investment, project, or policy proposal under consideration by any country, institution, or organization. To support the international community's efforts with quantifying changes in GHG emissions, the Food and Agriculture Organization of the United Nations (FAO) developed the EX-Ante Carbon-balance Tool (EX-ACT).

Based on the Intergovernmental Panel on Climate Change (IPCC) methodology, EX-ACT provides its users a consistent way of estimating and tracking the impact of agricultural, forestry, and other land-use (AFOLU) investments and policies on GHG emission levels. EX-ACT is a free, open-source, Excel-based model and is available in all UN languages, as well as Bahasa, Vietnamese, Portuguese and German.

Objectives



Identify the climate mitigation impact of various investments projects and policies.



Support countries in accessing funds from international financial institutions and international mechanisms to support projects, programmes and policies.



Strengthen the capacities of national stakeholders in estimating and monitoring emissions reductions goals from a wide range of projects.



Support policymakers in integrating climate change mitigation objectives into national policies and international commitments (e.g. nationally determined contributions).



Provide accurate and transparent estimates of GHGs emissions reductions using country or project-specific data if available.

WEBSITE

www.fao.org/tc/exact

EX- ACT COUNTRY CASE STUDIES

This report is part of a series of briefs, presenting project appraisals for different country case studies using either the EX-ACT Tool, which provides the potential climate change mitigation impacts of investment projects in the Agriculture, Forestry and Land Use (AFOLU) sector, or the EX-ACT MRV Tool, a project monitoring mechanism of the impact of greenhouse gases and adaptation to climate change on the same type of projects portfolio. Each brief provides a short description of the project analyzed, the main results obtained and the related materials (case study document, EX-ACT and EX-ACT MRV sheets). The tested projects treat the following areas: rural activities, agriculture, forestry, watershed and restoration of degraded soils.



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Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex: Appendix 4. Working Paper 4 Economic Study Drought In The Brazilian Semiarid 060420

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

February 2020

Green Climate Fund (CGF) - International Fund for Agricultural Development (IFAD)

Research Project: Drought in the Brazilian Semi-Arid

Final Report

Carlos Eduardo Frickmann Young

Lucas de Almeida Nogueira da Costa

Lucas Rolo Fares

1. Introduction

The original objective of this study was to verify if municipalities affected by droughts in the Brazilian drylands have suffered negative impacts in their agricultural production, with emphasis on family/subsistence farming. If positive, the second stage of the study was to provide preliminary estimates of the economic value of these impacts.

In order to do so, climatic effects were identified by episodes where there was an official statement of drought (“seca”) or dry spell (“estiagem”) according to the Civil Defense, or, alternatively, by episodes of very low annual precipitation averages. Dry spells (“estiagens”) refer to drought events that happened in a relatively short period of time, while drought (“seca”) refers to a long lasting drought.

The next sections detail the main procedures and results of the research. There are statistically significant results showing robust correlation between climate disasters and agricultural (cultivation and livestock) loss, especially for the crops typically associated with family/subsistence agricultural production in the drylands of the Brazilian Northeast and Minas Gerais. For cultivation, the analysis was based in both loss of productive area and output value, while for livestock we considered only the output value.

The results confirmed the hypothesis that drought and dry spell events (i) have significant economic impacts, (ii) affect proportionally more crops typically associated with family/subsistence farming, and (iii) have increased in recent years.

2. Data and variables

2.1. Data base

In order to study the impact of droughts on the agricultural production of the Brazilian semi-arid region, a municipal database was built for the Brazilian Northeastern region and the state of Minas Gerais. The database includes information on average precipitation, disaster episodes and agricultural production and cultivated/harvested area. Municipalities ("municípios") were chosen from all of these states, even if not located in drylands with the objective to provide treatment/control groups for econometric reasons.

In order to strengthen the results and analyze the progression of these effects over the last decades, taking into account the worsening effects of climate change, the study analyzed the 1981- 2016 period. However, since many variables are not available for the entire period, the analysis has focused on the last twenty years of the time series.

Two different variables were collected and constructed to estimate climate effects (in econometric terms, they are the independent variables - variables that have an effect on other dependent variables):

- municipalities with drought and dry spell episodes in a certain year, provided by the historical series of the Integrated Disaster Information System (S2iD); and
- the annual average precipitation, measured by the year monthly precipitation, collected by the National Meteorological Institute (INMET) stations and made available in the Meteorological Database for Teaching and Research (BPMED).

Both variables play a similar role in this study, identifying the municipalities that suffered from lack of rain in prolonged periods. However, the historical series of drought and dry spell episodes are only available from 2003 onwards. Therefore, for the 1981-2002 period, only statistics using INMET precipitation data were considered.

Climate disaster information from S2iD is already available from the geocode of the municipality that reported the drought or dry spell event. Therefore, they are included directly in the database using the municipality geocode. However, precipitation data is provided by the INMET meteorological information collection station, in spatial terms, that are not defined according to the political-administrative frontiers. In order to include them in the database, the ArcMap software was used in two stages: first, the data of the stations were interpolated by the Kriging method, using their respective geographical coordinates and generating a map for each year (Figure 1). From the interpolated maps, we used the Zonal Statistics function of ArcMap, adopting as mask the shapefile of municipalities in the Northeast and Minas Gerais, and obtaining the means of precipitation for each municipality (Figure 2). The unit of average precipitation is mm/month.

Figure 1. Climate stations and interpolated map, 2003.

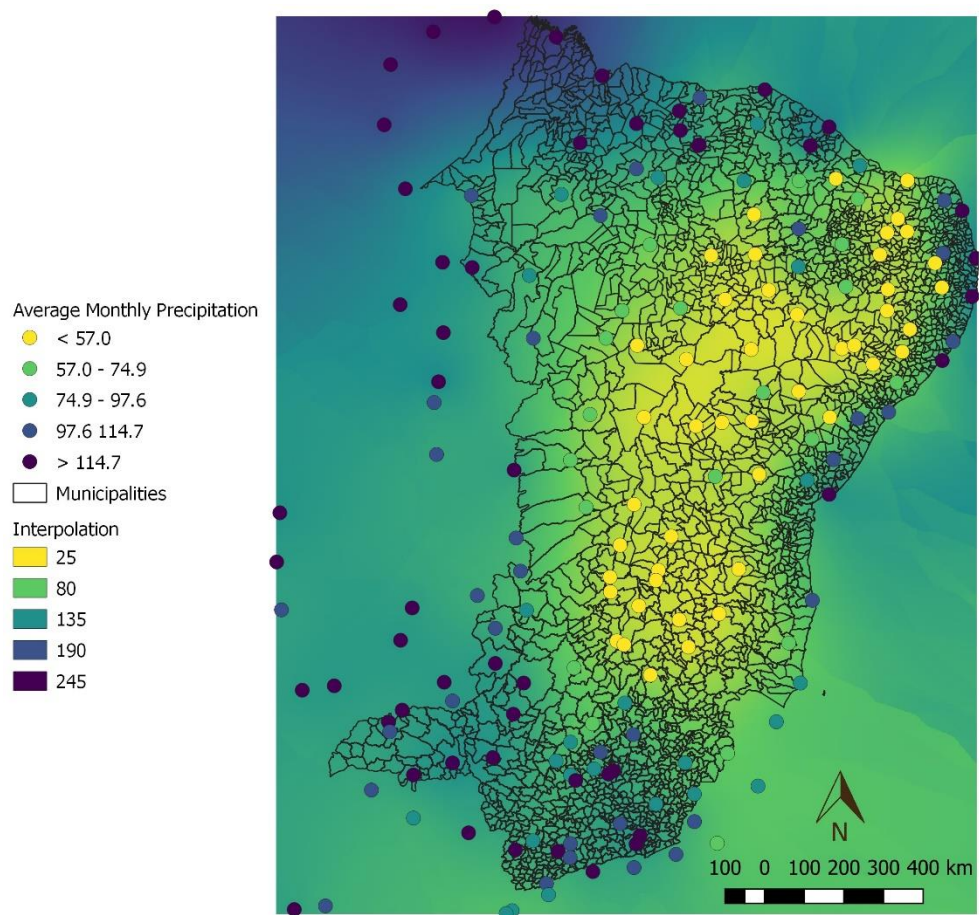


Figure 2. Municipal precipitation average, 2003.

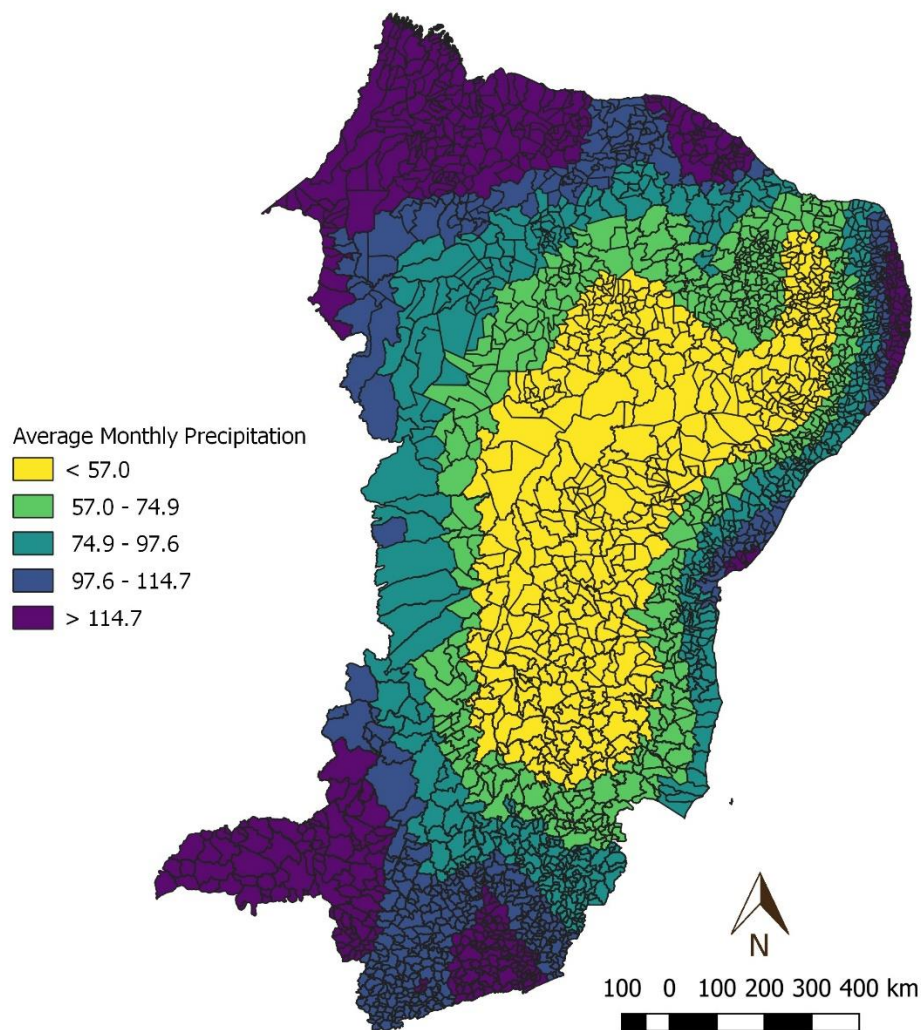
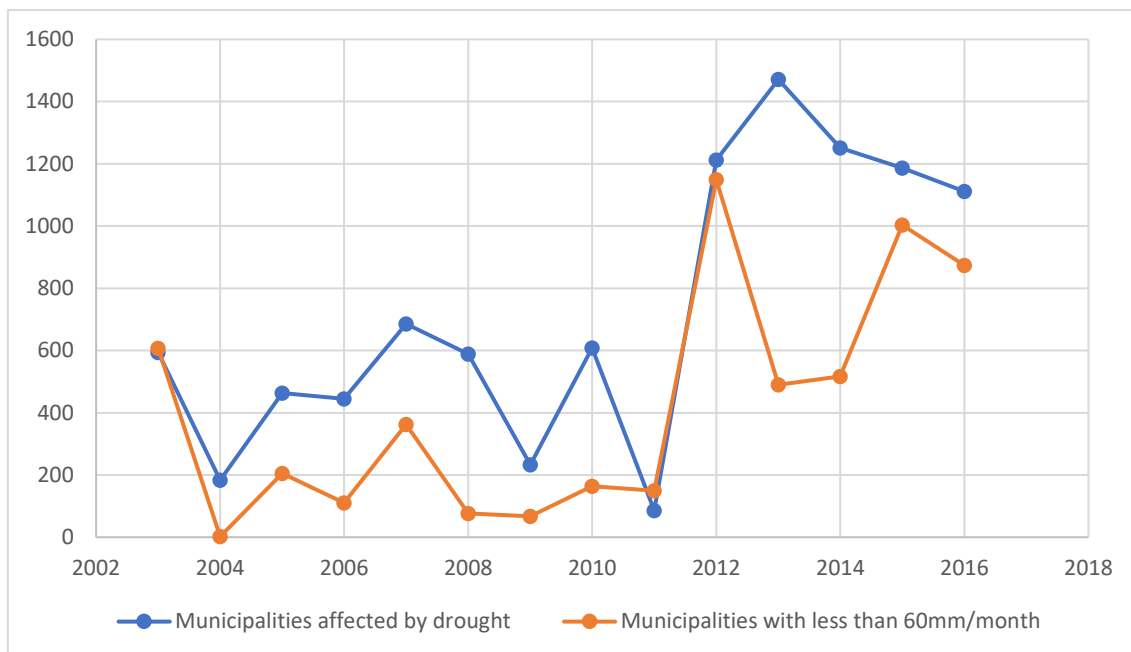


Figure 3 shows the evolution of municipalities that were subject to drought disaster and municipalities that the average precipitation was below 60mm/month over time. It is clear that (i) there is a strong correlation between these two variables (statistical evidence of this is provided in this report), and (ii) there was an increase of drought episodes in the second half of the period.

Figure 3. Evolution of municipalities affected by drought disasters (“seca” or “estiagem”) and municipalities with less than 60mm/month in Brazilian drylands, 2003-2016.



Source: Integrated Disaster Information System (S2iD) and Meteorological Database for Teaching and Research (BPMED)

Table 1 presents the distribution of drought events per Brazilian states accumulated over the 2003-2016 period. The most affected states are Ceará (CE), Piauí (PI) and Bahia (BA), followed by Minas Gerais (MG) and Rio Grande do Norte (RN).

Table 1. Accumulated drought events per Brazilian states, 2003-2016

State	“Seca” events	“Estiagem” events	Total events drought
AL	507	170	677
BA	68	1,939	2,007
CE	1,052	1,553	2,605
MA	-	210	210
MG	307	1,405	1,712
PB	169	2,670	436
PE	10	1,560	166
PI	359	1,781	2,140
RN	1,036	565	1,601
SE	193	73	266

Total	3,701	11,926	15,627
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Source: Integrated Disaster Information System (S2iD)

Data on agricultural production was collected from the Brazilian Institute of Geography and Statistics (IBGE), for physical output, production value and cultivated/harvested areas. These agricultural variables are the dependent variables of this study - variables that are impacted by the independent variables - and are used with the purpose of evaluating the losses (in output, value and cultivated area) due to droughts in the semi-arid region of Brazil.

For the agricultural output and area, data were collected from the table identified with the code 5457 in the IBGE Automatic Recovery System (SIDRA). It provides information on the following variables: area planted or intended for harvest, area harvested, quantity produced, average yield and value of production. The data are presented in a historical series - used in this research from 1981 to 2016 - with the annual values at the municipal level. These statistics come from the survey of Municipal Agricultural Production (PAM), held annually by IBGE.

SIDRA also provides livestock data, resulting from the survey on Municipal Livestock Production (PPM) - conducted annually. The tables identified with codes 3939, 95, 94 and 74 by SIDRA were collected for this study. The variables presented in each table are, respectively, the number of herds broken down by type (bovine, buffalo, equine, total swine, swine - pigs, goats, sheep, chickens - chickens, chickens and quails); quantity of sheared sheep (heads); milked cows (heads); volume and monetary values of products of animal origin (milk in thousand liters, chicken eggs in a thousand dozen, quail eggs in a thousand dozen, bee honey in kilograms, silkworm cocoons in kilograms and wool in kilograms). All are also broken down by municipalities and in a historical series - also used in this research from 1981 to 2016.

In order to focus on the effects on family/subsistence farming, we used the Agricultural Census, carried out by IBGE every ten years. The 2006 Agricultural Census presented a specific classification of “Family Agriculture” based on the definitions of Law No. 11,326/2006, which makes it possible to identify the main crops and family farms in that year. From this, it was possible to collect in annual PAMs and PPMs the quantities produced and yields of the crops with the highest family participation. Two tables were used: (i) SIDRA table 949, which shows, by municipality, the number of agricultural establishments, quantity produced, area harvested and production value by family and non-family farming and type of crop production - brown rice, black beans, colored beans, beans, cassava, corn, soybeans, wheat, coffee, coffee canephora (robusta, conilon) in grain (“green”); and (ii) table 1118, which also shows the number of agricultural establishments with production in the year and the value of production in the year by type of production - animal, subdivided into large, medium and small sizes and birds; vegetable, subdivided into permanent, temporary, horticulture, forestry and extraction; agroindustry.

The other Agricultural Censuses do not present a specific discrimination for family agriculture. However, the Censuses of 1995 and 2017 present statistics according to the

size of agricultural establishments, which allows to identify the municipalities where small properties are more common, in absolute and relative terms. For this, an assumption was made that the category of family agriculture is characterized by the small area of the property (indeed, the concept of family agriculture in Law n. 11,326 is based on the property size). SIDRA tables 312 (in the 1995 Census) and 6710 (in the 2017) present the quantities of establishments with less than 1 hectare, between 1ha and 2ha, between 2ha and 5ha, between 5ha and 10ha, between 20ha and 50ha, between 50ha and 100ha, between 100ha and 200ha, between 200ha and 500ha, over 500ha and the establishment with no declared area.

2.2. Descriptive Statistics

Table 2 presents average statistics for the cultivated area (“Área Plantada”), the harvested area (“Área Colhida”) and the average agricultural output (in constant 2016 R\$) for municipalities that have suffered with drought events (“seca” or “estiagem”) and those who did not. It is clear that drought events increase the loss of productive areas and considerably reduces the average annual agricultural output per hectare.

Table 2. Cultivated and harvested area, and average agricultural and livestock output, according to the occurrence of drought disasters, 2003-2016.

Drought events	Average cultivated area (ha)	Average harvested area (ha)	Average lost area (ha)	Average lost area (in %)	Average agricultural value (thousand R\$)	Average livestock value (thousand R\$)
No dry spells	6,890	6,696	195	2.8%	R\$ 26,435	R\$ 6,828
With dry spells	5,924	5,354	570	9.6%	R\$ 13,395	R\$ 4,029
No droughts	6,826	6,563	263	3.9%	R\$ 24,639	R\$ 6,283
With droughts	4,733	4,270	463	9.8%	R\$ 9,622	R\$ 5,352
Total (average)	6,624	6,349	275	4.1%	R\$ 23,386	R\$ 6,165

Table 3 presents similar results, but using average annual precipitation, rather than disaster declarations. In both methods, the results show that less precipitation are correlated with more loss of productive area and smaller annual average agricultural

output per hectare. However, using the average annual precipitation, the magnitude of the loss is considerably larger than the results with disaster declarations.

Table 3. Cultivated and harvested area, and average agricultural and livestock output, according to the annual precipitation, 2000-2016.

Precipitation categories	Average cultivated area (ha)	Average harvested area (ha)	Average lost area (ha)	Average lost area (in %)	Average agricultural value (thousand R\$)	Average livestock value (thousand R\$)
Less than 30mm (4)	4,744	2,805	1,939	40.9 %	R\$ 14,315	R\$ 3,046
Between 30mm and 60mm (3)	5,215	4,363	852	16.3 %	R\$ 13,368	R\$ 3,721
Between 60mm and 100mm (2)	6,427	6,168	259	4.0%	R\$ 18,391	R\$ 4,651
More than 100mm (1)	7,013	6,937	76	1.1%	R\$ 29,090	R\$ 7,669
Total (average)	6,499	6,221	278	4.3%	R\$ 22,278	R\$ 5,814

In order to analyze the consequences to family agriculture, the same statistics were made only for beans and corn. These crops were chosen as proxies for family agriculture because, according to the 2006 Brazilian Agricultural Census, beans and corns are produced mainly by family farming in the states selected in this study.

Cassava was not considered in the analysis because, even though most of production comes from family agriculture (88% of the harvested area, as shown in table 4), it represents a very minor share of the subsistence agriculture: table 5 shows that beans and corn have a much higher importance in total family agriculture output). This is clear in tables 4 and 5, which shows that

Table 4. Total and family agriculture harvested area (hectares) per different crops, in absolute and relative terms, according to IBGE 2006 Agricultural Census

Crop	Total harvested area (ha)	Total harvested area by family agriculture (ha)	% harvested by family agriculture
Rice	787,948	648,060	82.2%

Beans	3,163,011	2,688,850	85.0%
Cassava	822,969	724,329	88.0%
Corn	4,235,213	3,115,650	73.6%
Soy	2,170,132	32,722	1.5%
Coffee	878,980	323,046	36.8%
Total	12,058,253	7,532,657	62.5%

Table 5. Total and family agriculture relative share of each in terms of harvested area (%), according to IBGE 2006 Agricultural Census

% of each crop in harvested area	Total	Family agriculture
Rice	6.5%	8.6%
Beans	26.2%	35.7%
Cassava	6.8%	9.6%
Corn	35.1%	41.4%
Soy	18.0%	0.4%
Coffee	7.3%	4.3%
Total	100.0%	100.0%

Table 6 suggests that bean and corn plantations suffer the higher loss of cultivated area, (regardless of climate events) than the average of all crops (shown in Table 2). However, the presence of drought or dry spell events intensifies the losses areas for these crops of majority family production, measured by the difference between cultivated and harvested areas.

Table 6. Cultivated and harvested area, and average agricultural output for bean and corn crops, according to the occurrence of drought disasters, 2003-2016.

	Drought events	Average cultivated area (ha)	Average harvested area (ha)	Average lost area (ha)	Average lost area (in %)	Average agricultural value (thousand R\$)
Bean	No dry spells	801	736	64	8.0%	R\$ 1,287
	With dry spells	1,359	1,169	191	14.0%	R\$ 1,094
	No drought	900	812	88	9.8%	R\$ 1,280

	With drought	1,222	1,078	145	11.8%	R\$ 779
	Total (average)	915	824	91	10.0%	R\$ 1,234
Corn	No dry spells	1,510	1,425	85	5.6%	R\$ 2,712
	With dry spells	1,728	1,435	294	17.0%	R\$ 1,196
	No drought	1,553	1,432	121	7.8%	R\$ 2,491
	With drought	1,620	1,360	261	16.1%	R\$ 917
	Total (average)	1,544	1,415	129	8.4%	R\$ 2,359

Table 7 shows the results of cultivated and harvested area, and average agricultural output for bean and corn crops, according to the annual precipitation, 2000-2016. Results are similar to those obtained according to disaster declarations. Using precipitation categories, the average loss in bean and corn cultivated area is greater than the average loss for all crops in all precipitation categories. However, in categories 3 and 4 (the ones with less rain), there is a significant worsening in the losses of planted area, especially for corn: 73.5% average loss for municipalities with less than 30mm/month, and 26.6% loss for municipalities with an average of precipitation between 30 and 60mm/month.

Table 7. Cultivated and harvested area, and average agricultural output for bean and corn crops, according to the annual precipitation, 2000-2016.

	Precipitation categories	Average cultivated area (ha)	Average harvested area (ha)	Average lost area (ha)	Average lost area (in %)	Average agricultural value (thousand R\$)
Bean	Less than 30mm (4)	1,133	456	677	59.8%	R\$ 248
	Between 30mm and 60mm (3)	1,456	1,160	296	20.3%	R\$ 976
	Between 60mm and 100mm (2)	1,186	1,099	87	7.4%	R\$ 1,364
	More than 100mm (1)	528.1	514.1	14	2.7%	R\$ 1,177

	Total (average)	939	849	90	9.6%	R\$ 1,220
Corn	Less than 30mm (4)	1,460	387	1,073	73.5%	R\$ 122
	Between 30mm and 60mm (3)	1,652	1,213	439	26.6%	R\$ 664
	Between 60mm and 100mm (2)	1,599	1,481	118	7.4%	R\$ 1,850
	More than 100mm (1)	1,425	1,405	20	1.4%	R\$ 3,170
	Total (average)	1,530	1,401	129	8.4%	R\$ 2,240

2.3. Regression structure

The explanatory (independent) variables were:

- Climatic disasters (drought and drought): variable dummy (whether or not there was a drought disaster in the municipality in the year in question). Source of information: historical series of Atlas of Disasters, from data of the Civil Defense
- Precipitation: categorical variable of the mean precipitation of the year, in the municipality in question (data of rainfall stations, interpolated by municipality, INMET data). The choice by categorical variables (by average precipitation range) and non-linear variables is due to the fact that results fit better, considering the wide range of variation of numerical results.

Four main groups of dependent variables were considered:

- (i) “loss of productive area = cultivated area - harvested area” (average absolute loss) and “percentage loss of productive area = (cultivated area – harvested area)/cultivated area” (average relative loss);
- (ii) “value of agricultural production” and the “natural logarithm of the value of agricultural production” (to examine the percentage loss);
- (iii) “value of livestock production (total)” and the “natural logarithm of the value of livestock production” (to examine the percentage loss);
- (iv) “effective of the herds (bovine, goat, etc.)” and the “natural logarithm of the effective of the herds” (to examine the percentage loss).

Different regressions were made with changes on the functional form and the categorization of the activities considered. In order to emphasize the effects on subsistence farming, two set of regressions was made using only the production of bean

and corn, considering (i) the loss of productive area and (ii) the value of agricultural production.

For livestock, exercises were performed comparing herds of different animals (cattle, goats, sheep) and honey, but the results were very similar and, therefore, we worked only with the aggregate series, considering the overall “pecuária” IBGE category (livestock and other animal products) production. The main reason for the low sensitiveness of changes of results considering different livestock is that livestock outputs are less affected by the climatic variation than crop cultivation.

In spatial terms, the analysis was carried out in two different levels: (i) municipalities (“municípios”); and (ii) aggregation according to the IBGE micro-regions. This decision was made due to a trade-off between these two strategies: while the results by municipality may have bias due to the creation and dismemberment of municipalities in the period,¹ which damages the comparison over time since the area of the affected municipalities change, the microregions have much more stable delimitations.² However, the identification of correlations (coefficients tend to be underestimated because of a greater diffusion of cause and effect indicators) is more difficult using the higher aggregation level of microregions. In this description the analyzes take into account mainly the regressions by municipality, but the interpretations of the coefficients are very similar for the regressions by micro-region.

Natural logarithm was the chosen functional form to find the impact of explanatory variables on the output value of agricultural and livestock production, and also on the size of livestock herds. The resulting coefficients were normalized so that their interpretation was done in terms of percentage points (unit for the arithmetic difference of two percentages).³

¹ In 1980, there were 3,991 municipalities. In 2010, the number of municipalities increased to 5,565, and in 2017 they are 5,570. https://ww2.ibge.gov.br/home/geociencias/geografia/default_evolucao.shtm

² In 2017 there are 558 IBGE micro-regions in Brazil, the same number as in 1980.

³ As the series studied are very long, it is difficult to add control variables at the municipal (or micro-regional) level. Thus, we chose to construct only one monthly average maximum temperature control variable, using the same INMET database and the same precipitation interpolation methodology. To control other effects that impacts on the dependent variables, we run the regression in panel format with fixed effects in years and municipalities (or micro-region). These fixed effects allows us to control one-dimensional effects: variables that impacts the municipality i in the same way during all years (topographic conditions, distance from the municipality to the coast); and variables that impact all municipalities in the same way in year t (agricultural prices, dollar quotation). This empirical strategy, in addition to the long period observed, is enough for us to believe in the robustness of the used model.

3. Regressions Exercises

3.1. Exercise 1: Droughts x Average Precipitation

The first set of regressions was made to investigate the correlation between droughts that were reported by Civil Defense as climatic disasters (“seca” and “estiagem”) and the average precipitation in the region. In order to reduce the wide variation in this variable, the average precipitation was also divided by categories (1: greater than 100 mm/month, 2: 60 to 100mm/month, 3: from 30 to 60mm/month, 4: less than 30mm/month). The average of maximum temperature of each month was used, from the INMET base, was used as a control variable. Table 6 presents the results.⁴

Table 8. Correlation between climatic disasters (droughts and drought) and average precipitation, linear and by category (1: greater than 100 mm / month, 2: 60 to 100, 3: from 30 to 60, 4: less than 30), analysis per municipalities.

	(1)	(2)
Variables	Dummy Disasters	
Precipitation (mm/month)	-0.00197***	
	(0.000124)	
Dummy Precipitation (2)		0.0445***
		(0.00585)
Dummy Precipitation (3)		0.268***
		(0.00980)
Dummy Precipitation (4)		0.385***
		(0.0247)
Constant	0.405***	0.153***
	(0.0124)	(0.00730)
Period	Post 2003	
Level	Municipality	
Observations	37,030	37,058
R-squared	0.220	0.245
Number of Mun	2,645	2,647
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

⁴ The results as a percentage of table 8 to table 13 should actually have the coefficients interpreted as an increase in percentage points (for example, if a coefficient is 0.05, the interpretation is an increase of 5 percentage points). In tables 14 to table 19, where percentage results were reached using the natural logarithms of absolute values, the interpretation should be done at a percentage increase (eg if the coefficient is 0.05, the interpretation is that there is an increase of 5%).

Both regressions demonstrate strong adherence, as expected: the categories of lower average precipitation (3 and 4) are strongly correlated with drought disasters.

The probability of a municipality in category 4 being subject to a drought or dry spell is 38.5 percentage points higher than in category 1; in the category 3, this probability is 26.7 percentage points higher; and in 2 it is only 4.45 percentage points higher. All these results are statistically significant at the 1% level.

We proceeded the same analysis considering IBGE micro-regions, instead of municipalities (table 9).

Table 9. Correlation between climatic disasters and average precipitation, linear and by category (1: greater than 100 mm/month, 2: 60 to 100, 3: from 30 to 60, 4: less than 30), analysis per micro-regions

	(1)	(2)
Variables	Dummy Disasters	
Precipitation (mm/month)	-0.00199***	
	(0.000456)	
Dummy Precipitation (2)		0.0682***
		(0.0230)
Dummy Precipitation (3)		0.121***
		(0.0327)
Dummy Precipitation (4)		-0.0366
		(0.0899)
Constant	0.646***	0.416***
	(0.0397)	(0.0269)
Period	Post 2003	
Level	Microregion	
Observations	3,542	3,556
R-squared	0.196	0.196
Number of Micro	253	254
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

In the analysis based on micro-regions, Category 4 data are statistically non-significant (they do not differ from Category 1). This is because micro-region observations in Category 4 are very scarce. However, as expected, under category 3, the probability of the micro-region presenting a disaster is 12.1 percentage points higher than in category 1; while in Category 2 the probability is 6.8 percentage points higher.

Our conclusion is that results validate the expected hypothesis that droughts in the Brazilian drylands can be measured either using data on the occurrence of reported drought and dry spell events in the Atlas of Natural Disasters, or using the average precipitation (linear or by category), using INMET data.

We also considered that results using the average precipitation are statistically more robust than those using disaster declarations. Therefore, in the next exercises, we proceeded only with the estimates according to the annual average precipitation.

3.2. Second Exercise: Loss of Productive Area x Drought Disasters or Average Precipitation

The second set of regressions shows the correlation between climatic variables (measured either by the number of drought occurrences or average precipitation) and the loss of productive area, measured by the difference between cultivated area and harvested area in each municipality or IBGE micro-region.

As a control variable for the regressions that used the climatic disaster dummy, an interval of one year before and one year after the year of the disaster incidence was considered, since the effects of this disaster on the production can present temporal lags (dry spells and drought event may have been declared after a long period of lack of precipitation, or the effects of dry spells or droughts may persist for some time after the disaster declaration).

The results in table 10 show the effect of drought occurrence in the productive area in terms of municipalities, while table 9 presents the same results in terms of IBGE micro-regions. The first column refers to the impact on the total lost area in absolute terms without considering a time-lag effect, while the second column introduces a two-period time lag. The third column refers to the total loss of productive area in percentage points, while the two last columns focus on specific crops associated with family/subsistence agriculture (beans and corn, also in percentage points), all of them considering time lag dummies in the analysis. All regressions show statistically significant reduction of productive area, and this loss is more intense in the traditional family agriculture (beans and corn) than in other crops.

Table 10. Regression analysis of the loss productive area (in absolute and relative terms) and the occurrence of drought disasters, by municipalities

	(1)	(2)	(3)	(4)	(5)
Variables	Total Lost Area (ha)	Total Lost Area (%)	Beans Lost Area (%)	Corn Lost Area (%)	
Dummy Disaster	32.74	-43.16*	0.0282***	0.0319***	0.0464***
	(23.56)	(25.71)	(0.00322)	(0.00408)	(0.00461)

Dummy Disaster (t-1)		79.18***	0.0271***	0.0410***	0.0509***
		(22.05)	(0.00270)	(0.00352)	(0.00401)
Dummy Disaster (t+1)		19.99	0.00286	0.00734*	0.0123***
		(24.92)	(0.00309)	(0.00390)	(0.00428)
Average Max Temperature	94.91***	97.09***	0.0288***	0.0255***	0.0435***
	(15.64)	(15.16)	(0.00246)	(0.00313)	(0.00353)
Constant	-2,661***	-2,654***	-0.816***	-0.706***	-1.245***
	(479.6)	(458.1)	(0.0744)	(0.0944)	(0.106)
Period	Post 2003	Post 2004	Post 2004	Post 2004	Post 2004
Level	Municipality	Municipality	Municipality	Municipality	Municipality
Observations	36,880	31,303	31,288	29,484	29,709
R-squared	0.011	0.012	0.095	0.100	0.126
Number of mun	2,640	2,613	2,613	2,551	2,554
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 11. Regression analysis of the loss productive area (in absolute and relative terms) and the occurrence of drought disasters, by IBGE micro-regions

	(1)	(2)	(3)	(4)	(5)
Variables	Total Lost Area (ha)	Total Lost Area (%)	Beans Lost Area (%)	Corn Lost Area (%)	
Dummy Disaster	-735.1	-1,095	-0.0113	-0.0139	-0.0134
	(642.5)	(739.7)	(0.00735)	(0.0106)	(0.0113)
Dummy Disaster (t-1)		56.13	-0.00417	-0.00255	0.00813
		(202.7)	(0.00462)	(0.00754)	(0.00782)
Dummy Disaster (t+1)		296.4	-0.0140*	-0.0219**	-0.0211**
		(505.2)	(0.00760)	(0.00966)	(0.0104)
Average Max Temperature	1,157***	1,172***	0.0287***	0.0297***	0.0442***
	(394.3)	(390.6)	(0.00590)	(0.00852)	(0.00997)
Constant	-32,749***	-32,503***	-0.803***	-0.808***	-1.240***
	(12,118)	(11,944)	(0.179)	(0.258)	(0.301)
Period	Post 2003	Post 2004	Post 2004	Post 2004	Post 2004
Level	Microregion	Microregion	Microregion	Microregion	Microregion
Observations	3,542	3,036	3,036	2,995	2,963
R-squared	0.026	0.027	0.123	0.145	0.168
Number of micro	253	253	253	252	250

Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Tables 12 and 13 are similar to tables 10 and 11, with the difference that precipitation categories were used, instead of the occurrence of drought disasters. Again, results are statistically significant, even though their interpretation is better understood when the driest categories (3 and 4) are compared to the wettest (category 1). Also, it shows that the effect in the loss of productive areas is higher in corn and beans than for other crops.

Table 12. Regression analysis of the loss productive area (in absolute and relative terms) and precipitation categories, by municipalities

Variables	Total Lost Area (ha)	Total Lost Area (%)	Beans Lost Area (%)	Corn Lost Area (%)
Dummy Precipitation (2)	2.131 (10.18)	-0.00382** (0.00150)	-0.00260 (0.00207)	0.000819 (0.00230)
Dummy Precipitation (3)	455.4*** (41.07)	0.101*** (0.00377)	0.126*** (0.00492)	0.164*** (0.00531)
Dummy Precipitation (4)	1,179*** (133.3)	0.264*** (0.0123)	0.406*** (0.0154)	0.490*** (0.0153)
Average Max Temperature	57.27*** (9.874)	0.0169*** (0.00115)	0.0117*** (0.00148)	0.0199*** (0.00153)
Constant	-1,475*** (293.8)	-0.485*** (0.0346)	-0.327*** (0.0444)	-0.586*** (0.0459)
Period	Post 1988	Post 1988	Post 1988	Post 1988
Level	Municipality	Municipality	Municipality	Municipality
Observations	72,920	72,905	69,346	69,527
R-squared	0.031	0.141	0.152	0.184
Number of Mun	2,644	2,644	2,632	2,636
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 13. Regression analysis of the loss productive area (in absolute and relative terms) and precipitation categories, by IBGE micro-regions

	(1)	(2)	(3)	(4)
Variables	Total Lost Area (ha)	Total Lost Area (%)	Beans Lost Area (%)	Corn Lost Area (%)
Dummy Precipitation (2)	-658.0	-0.00335	-0.00138	0.00500
	(1,521)	(0.00404)	(0.00572)	(0.00646)
Dummy Precipitation (3)	5,261**	0.103***	0.146***	0.179***
	(2,524)	(0.0104)	(0.0134)	(0.0147)
Dummy Precipitation (4)	13,089**	0.282***	0.444***	0.517***
	(5,315)	(0.0337)	(0.0404)	(0.0377)
Average Max Temperature	-2,753	0.0135***	0.00708*	0.0192***
	(2,213)	(0.00281)	(0.00408)	(0.00444)
Constant	12,242	-0.381***	-0.184	-0.566***
	(62,610)	(0.0856)	(0.125)	(0.135)
Period	Post 1988	Post 1988	Post 1988	Post 1988
Level	Microregion	Microregion	Microregion	Microregion
Observations	9,108	7,336	7,254	7,197
R-squared	0.506	0.199	0.221	0.251
Number of Micro		253	253	253
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

The results of the regressions in tables 10 and 11 (lost area X occurrence of disasters) generally show a loss of cultivated area lower than in the regressions of tables 12 and 13 (lost area X average precipitation). This is possibly a consequence of the statistical limitation imposed by the information presented by the Atlas of Natural Disasters, which consists of the declaration of the number of occurrences of drought or drought in the municipality, but without presenting details or qualitative and quantitative information about the size of this disaster.

The results in table 11 do not present statistically significant coefficients. This is probably due to the smaller number of observations when aggregating by microregion, which increases the standard deviation of the coefficients. In Table 13, where the observations are also by microregion, the results are, for the most part, statistically significant. Although the standard deviations are also higher, the division by precipitation bands is a more complete and less biased empirical strategy, allowing a stronger correlation with lost areas and drought.

The average precipitation variable allows a greater range of situations, establishing a degree of comparison about the intensity of the rainfall. For this reason, we recommend that the regression results be used in the subsequent analyzes, since the regressions in

tables 10 and 11 may underestimate the drought sizing, since it considers in equivalent terms a municipality with no problems of rainfall with another one that has had a considerable fall in precipitation but which has not reached the required gravity for the decree of a drought disaster. Furthermore, the categorization of “seca” (drought) and “estiagem” (dry spell) situations depends on the interpretation of the local authority, which is influenced by factors which may vary from municipality to municipality.

3.3. Third Exercise: Agriculture Production Value x Drought Disasters or Average Precipitation

We also analyzed the effects of droughts on the output production value using the annual Municipal Agricultural Survey of the IBGE in both absolute and relative terms, for the total production, beans and corn. Tables 14 and 15 consider the occurrence of drought events. The difference between them is that regression presented in table 14 used municipalities, while in table 15 we use IBGE micro-regions. Results are statistically significant, showing that droughts affect negatively agricultural output, and this effect is higher in family agriculture crops (corn, in first place, and then beans) than in the total production.

Table 14. Regression analysis of the effects of drought disasters in agricultural production (in absolute and relative terms), by municipalities.

Variables	Agriculture Production Value (thousand R\$)	Agriculture Production Value (%)	Bean Production Value (%)	Corn Production Value (%)	
Dummy Disaster	-2,306*** (784.3)	-1,867*** (652.0)	-0.1918*** (0.0126)	-0.2576*** (0.0259)	-0.335*** (0.0269)
Dummy Disaster (t-1)		-1.193 (713.6)	-0.096*** (0.0129)	-0.2327*** (0.0243)	-0.2517*** (0.0253)
Dummy Disaster (t+1)		-709.5 (474.8)	0.0337** (0.0137)	0.1595*** (0.0251)	0.1723*** (0.0250)
Average Max Temperature	-1,194*** (367.6)	-1,105*** (392.9)	-0.1829*** (0.0118)	-0.2825*** (0.0217)	-0.3849*** (0.0213)
Constant	57,274*** (11,228)	54,234*** (11,563)	14.78*** (0.357)	15.54*** (0.653)	20.25*** (0.640)
Period	Post 2003	Post 2004	Post 2004	Post 2004	Post 2004
Level	Municipality	Municipality	Municipality	Municipality	Municipality
Observations	36,880	31,303	31,303	31,303	31,303
R-squared	0.013	0.012	0.124	0.147	0.213
Number of mun	2,640	2,613	2,613	2,613	2,613
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Coefficients in an exponential form (EXP(coef)-1)

Table 15. Regression analysis of the effects of drought disasters in agricultural production (in absolute and relative terms), by IBGE micro-regions

Variables	Agriculture Production Value (thousand R\$)	Agriculture Production Value (%)	Bean Production Value (%)	Corn Production Value (%)	
Dummy Disaster	19,672 (15,889)	17,612 (15,088)	0.0295 (0.0244)	0.0520 (0.0645)	0.2214** (0.0828)
Dummy Disaster (t-1)		28,798* (15,501)	0.0934*** (0.0226)	0.1491*** (0.0481)	0.2008*** (0.0526)
Dummy Disaster (t+1)		8,812 (9,164)	0.1162*** (0.0253)	0.3337*** (0.0660)	0.5128*** (0.0612)
Average Max Temperature	-20,802*** (6,401)	-17,657*** (6,121)	-0.1521*** (0.0251)	-0,27094055 (0.0653)	-0.4184*** (0.0695)
Constant	843,976*** (195,734)	727,830*** (185,430)	16.26*** (0.760)	17.71*** (1.979)	24.36*** (2.092)
Period	Post 2003	Post 2004	Post 2004	Post 2004	Post 2004
Level	Microregion	Microregion	Microregion	Microregion	Microregion
Observations	3,542	3,036	3,036	3,036	3,036
R-squared	0.044	0.047	0.106	0.177	0.251
Number of micro	253	253	253	253	253
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Tables 16 and 17 are analogous to tables 14 and 15, but using average precipitation categories instead of drought events. The regression presented in table 16 uses municipalities, while the regression in table 17 considers IBGE micro-regions. Again, results are statistically significant showing that droughts affect negatively agricultural output, and this effect is higher in family agriculture crops (corn, in first place, and then beans) than in the total production.

Table 16. Regression analysis of the precipitation categories in agricultural production (in absolute and relative terms), by municipalities

Variables	Agriculture Production Value (thousand R\$)	Agriculture Production Value (%)	Bean Production Value (%)	Corn Production Value (%)
Dummy Precipitation (2)	-12.69	-0.0522***	-0.00143	-0.0471***

	(532.8)	(0.00902)	(0.0153)	(0.0155)
Dummy Precipitation (3)	-1,505**	-0.352***	-0.529***	-0.6641***
	(752.8)	(0.0181)	(0.0305)	(0.0290)
Dummy Precipitation (4)	-3,682***	-0.6171***	-0.9111***	-0.9433***
	(773.2)	(0.0401)	(0.0764)	(0.0713)
Average Max Temperature	1,418***	0.00672	-0.0107	-0.0684***
	(289.0)	(0.00754)	(0.0117)	(0.0115)
Constant	-30,675***	8.560***	6.386***	7.532***
	(8,817)	(0.221)	(0.344)	(0.336)
Period	Post 1981	Post 1981	Post 1981	Post 1981
Level	Municipality	Municipality	Municipality	Municipality
Observations	87,685	87,685	87,685	87,685
R-squared	0.026	0.072	0.118	0.189
Number of mun	2,645	2,645	2,645	2,645
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				
Tabela com coeficientes relevantes na fórmula EXP(coef)-1				

Table 17. Regression analysis of the precipitation categories in agricultural production (in absolute and relative terms), by IBGE micro-regions

Variables	Agriculture Production Value (thousand R\$)	Agriculture Production Value (%)	Bean Production Value (%)	Corn Production Value (%)
Dummy Precipitation (2)	-4,302	-0.0200	0.00798	-0.0346
	(9,988)	(0.0252)	(0.0402)	(0.0433)
Dummy Precipitation (3)	-15,259	-0.2591***	-0.4674***	-0.6404***
	(12,511)	(0.0462)	(0.0734)	(0.0811)
Dummy Precipitation (4)	-25,402*	-0.4779***	-0.8907***	-0.9565***
	(13,966)	(0.0889)	(0.253)	(0.237)
Average Max Temperature	10,790**	0.00810	-0.00887	-0.0558
	(5,304)	(0.0181)	(0.0306)	(0.0339)
Constant	-212,938	10.74***	8.690***	9.184***
	(165,505)	(0.522)	(0.891)	(0.989)
Period	Post 1981	Post 1981	Post 1981	Post 1981
Level	Microregion	Microregion	Microregion	Microregion
Observations	9,108	9,108	9,108	9,108
R-squared	0.083	0.134	0.147	0.257
Number of micro	253	253	253	253
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

The results of the regressions using the value of the agricultural production (from table 14 to table 17) indicate that the size of the losses caused by less precipitation is even more expressive, considering both estimation methods (declared disaster events and precipitation bands). Overall, despite the difference in the magnitude of the results, the conclusions reached by this set of regressions is relatively similar to the regressions by the lost areas.

3.4. Fourth Exercise: Livestock Production Value x Drought Disasters or Average Precipitation

Finally, we proceeded a similar analysis for the value of livestock production using data from the Annual Municipal Livestock Survey (PPM/IBGE). The results are also

statistically significant in terms of the reduction in livestock output value associated to drought disasters or less precipitation. The regressions in tables 18 and 19 consider the occurrence of drought disasters, while the regressions in tables 20 and 21 used precipitation categories. Tables 18 and 20 are based on municipal data, while tables 19 and 21 are based on IBGE micro-regions.

Table 18. Regression analysis of the effects of drought disasters in livestock production (in absolute and relative terms), by municipalities

Variables	Livestock Production Value (thousand R\$)	Livestock Production Value (thousand R\$)	Livestock Production Value (%)
Dummy Disaster	-572.6***	-532.6***	-0.029***
	(92.60)	(81.48)	(0.00747)
Dummy Disaster (t-1)		-90.68	-0.00868
		(110.9)	(0.00720)
Dummy Disaster (t+1)		-565.2***	-0.0177**
		(76.08)	(0.00742)
Average Max Temperature	-24.36	-20.22	0.00307
	(84.53)	(72.05)	(0.00608)
Constant	5,463**	5,387**	7.384***
	(2,612)	(2,158)	(0.182)
Period	Post 2003	Post 2004	Post 2004
Level	Municipality	Municipality	Municipality
Observations	37,006	31,410	31,410
R-squared	0.053	0.054	0.104
Number of mun	2,645	2,619	2,619
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			
Tabela com coeficientes relevantes na fórmula EXP(coef)-1			

Table 19. Regression analysis of the effects of drought disasters in livestock production (in absolute and relative terms), by IBGE micro-regions

Variables	Livestock Production Value (thousand R\$)	Livestock Production Value (thousand R\$)	Livestock Production Value (%)
Dummy Disaster	-3,108*	-2,431*	-0.00400
	(1,596)	(1,422)	(0.0137)
Dummy Disaster (t-1)		-1,496	-0.000332
		(1,455)	(0.0155)
Dummy Disaster (t+1)		-2,779**	-0.0159
		(1,365)	(0.0158)
Average Max Temperature	-632.5	-228.3	-0.000323
	(1,695)	(1,471)	(0.0149)
Constant	68,941	57,398	10.06***
	(52,383)	(44,381)	(0.452)
Period	Post 2003	Post 2004	Post 2004
Level	Microregion	Microregion	Microregion
Observations	3,542	3,036	3,036
R-squared	0.154	0.155	0.216
Number of mun	253	253	253
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 20. Regression analysis of the precipitation categories in livestock production (in absolute and relative terms), by municipalities

Variables	Livestock Production Value (thousand R\$) - Total	Livestock Production Value (%) - Total
Dummy Precipitation (2)	-172.3***	0,00748
	-58,46	-0,00662
Dummy Precipitation (3)	-249.6**	-0.0342***
	-98,7	-0,0109
Dummy Precipitation (4)	-366.9***	-0.1672***
	-135,9	-0,0205
Average Temperature Max	178.8***	0.0129**
	-52,36	-0,00617
Constant	-2,855*	6.681***
	-1565	-0,18
Period	Post 1981	Post 1981
Level	Municipality	Municipality
Observations	87871	87871
R-squared	0,069	0,216
Number of Mun	2645	2645
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 21. Regression analysis of the precipitation categories in livestock (in absolute and relative terms), by IBGE micro-regions

Variables	Livestock Production Value (thousand R\$)	Livestock Production Value (%)
Dummy Precipitation (2)	-2,788**	0.0365*
	-1105	-0,0185
Dummy Precipitation (3)	-3,029*	0,0118
	-1743	-0,0291
Dummy Precipitation (4)	-3371	-0.1121**
	-2290	-0,0471
Average Max Temperature	424,2	0,0134
	-867,3	-0,0167
Constant	12899	8.917***
	-26050	-0,484
Period	Post 1981	Post 1981
Level	Microregion	Microregion
Observations	9108	9108
R-squared	0,205	0,404
Number of micro	253	253
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

The regressions of the value of livestock production points to less expressive results than the regressions by the lost area and by the value of agricultural production. In fact, when we use the micro-region aggregation level for both drought events and precipitation bands, the coefficients are statistically non-significant. For the results of the regressions by municipalities, the losses are statistically significant – once again, the results by the precipitation range are stands out – but at a lower level than in the previous cases.

These results indicate that cattle ranching and other animal livestock activities are more resilient t climate events. Therefore, in the estimation of the economic losses caused by climate events, we focused only on cultivation.

4. Valuation of economic losses

This section estimates the costs of droughts in the Brazilian Semi-Arid (Caatinga) with the regression results from the previous sections. After that, we use forecasts about future reduction in precipitation in the region due to climate change in order to calculate the potential loss in agricultural production in the 2017-2030 and 2017-2050 periods.

The methodology was based on the use of selected results of the regressions from the previous section that presented the best fit. Only results for cultivation (total and bean and

corn) were considered, since they presented the most significant econometric results. This means that the results presented in this section underestimate the total agricultural losses due to droughts since the livestock production was not considered since the regressions presented smaller degrees of statistical confidence.

More specifically, we chose to use the coefficients from the regressions with the empirical strategy based on the precipitation bands by municipalities, to quantify the relative losses of planted area and respective value of agricultural production. For this reason, only the coefficients for categories 3 and 4 of precipitation (monthly averages less than 60mm) were considered and applied to municipalities and years that fit in these bands. To evaluate the losses of subsistence agriculture, we considered the losses for bean and corn as proxies, since they are the most representative for smallholders.

4.1. Losses of production areas over time

To estimate the losses of productive area in the period 1990-2016, we selected the coefficients from table 10 for the categories of very low precipitation “3” (monthly average between 30 and 60mm) and “4” (monthly average less than 30mm). Results are presented in table 22.

Table 22. Coefficients of lost production area by precipitation category

Precipitation	Lost Area (%)	Lost Area - Bean (%)	Lost Area - Corn (%)
Between 30 and 60mm/month (3)	10.1%	12.6%	16.4%
Less than 30mm/month (4)	26.4%	40.6%	49.0%

The municipalities with the lowest precipitation average (“4”, less than 30mm/month), on average, lost 26.4% of their productive area, considering all crops. In the municipalities where the droughts are less intense (“3”, between 30 and 60mm/month) the average loss was 10.1%. However, the losses are much more significant for the crops typically produced by family agriculture (bean and corn), especially in the worst case (category “4”), where the loss of cultivated area is more than 40% on average (40.6% for beans and 49.0% for corn). This is a strong indication that the effects of intense reduction in precipitation are disproportionally higher in the typical products of family agriculture.

Assigning the coefficients to the municipalities that fall within each category and, subsequently, multiplying by the respective planted areas, we estimate the productive areas lost due to the drought.

$$\text{Lost Area due Drought}_t = \text{Productive Area}_t * \text{Lost Area Coefficient}$$

Figure 4 shows the estimates of lost productive area due to droughts, in absolute and relative terms, for the 1990-2016 period.⁵

⁵ Table II in the Appendix presents the number results.

Figure 4. Lost area due to drought over time, 1990-2016.

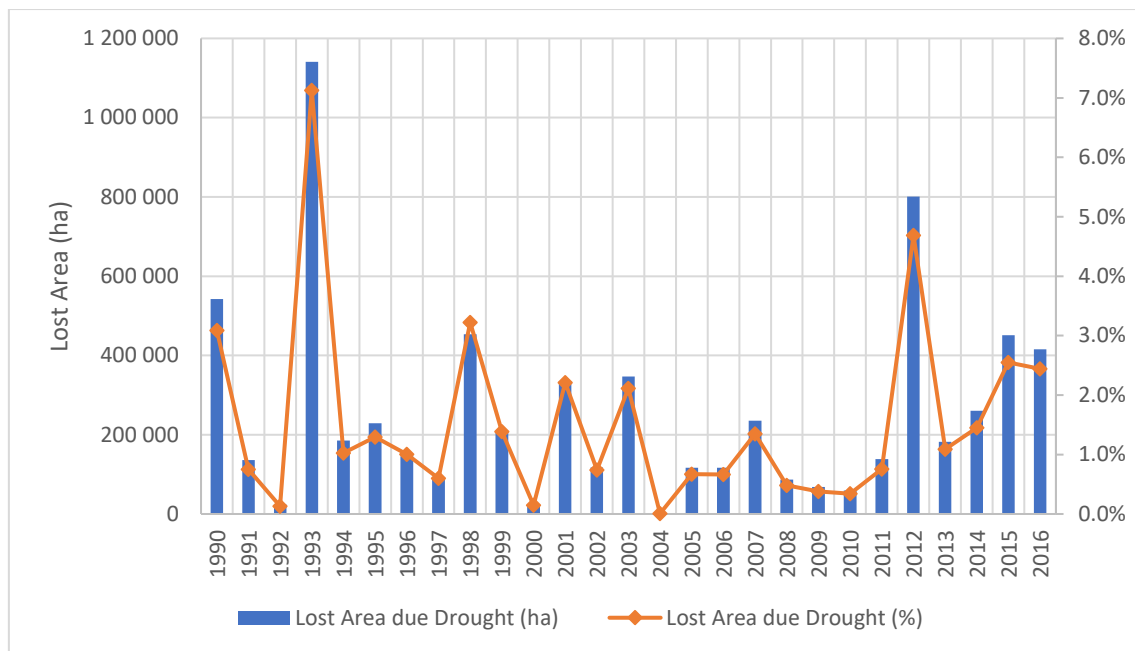
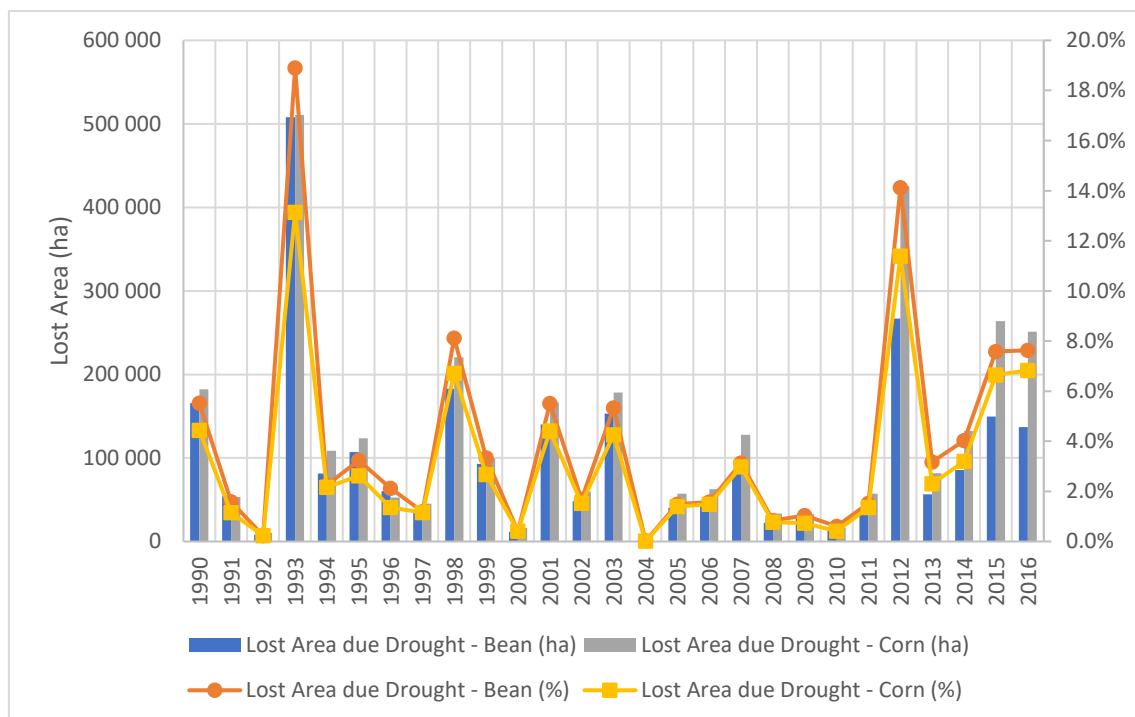


Figure 5 shows the absolute and relative losses of productive area only for bean and corn cultivation. The trends are similar to the total lost productive areas in Figure 4. However, it is clear that the percentage lost in the production of beans and corn is considerably higher than that observed in all other crops.

Figure 5. Bean and corn area lost due to drought over time, 1990-2016.



Although 1993 was the year in which maximum losses were recorded, the figures suggest a relatively erratic pattern of the productive areas lost over the years up to 2012. However, since that year, there is a change in the pattern of the losses estimated by drought: the graphs suggest that the average area lost in this decade is relatively higher than in previous decades - even with the large losses observed in 1993.

This less erratic and more stationary pattern in recent years may indicate a more prolonged effect of droughts. As pointed out by Marengo et al. (2017), analyzing the climatic characteristics of the 2010-2016 drought in the semiarid Northeast Brazil region:

“The analysis of this event using drought indicators as well as meteorological fields shows that since the middle 1990s to 2016, 16 out of 25 years experienced rainfall below normal. This suggests that the recent drought may have in fact started in the middle-late 1990s, with the intense droughts of 1993 and 1998, and then the sequence of dry years (interrupted by relatively wet years in 2007, 2008, 2009 and 2011) after that may have affected the levels of reservoirs in the region, leading to a real water crisis that was magnified by the negative rainfall anomalies since 2010.”

Table 23 shows ten-year averages of the relative lost areas of the last three decades. In addition to confirming that the present decade presents larger average losses, the table shows, again, that the increase of these losses has more intensity in the most typical crops used in family agriculture (bean and corn).

Table 23. Average lost area due to drought, by decade.

Decade	Lost Area due Drought (%)	Lost Area due Drought - Bean (%)	Lost Area due Drought - Corn (%)
1991-2000	1.7%	4.1%	3.2%
2001-2010	0.9%	2.1%	1.8%
2011-2016	2.2%	6.3%	5.3%

4.2. Losses of agricultural production value over time

The estimate of the value of agricultural output lost by drought consists of the product between the area lost by the drought, estimated in the previous sub-section, and the average value of the production per hectare harvested.

$$\begin{aligned}
 \text{Lost Value due Drought}_t & \\
 &= \text{Lost Area due Drought}_t * \text{Average Agricultural Value}_t
 \end{aligned}$$

Figure 6 shows the losses of value of agricultural production during the last decades. Similar to the area lost by drought, the series shows an erratic behavior, with large variations, until 2012, when there is a more stable pattern of greater than the average losses due to drought.

Figure 6. Lost Agricultural Production Value due to drought over time, 1990-2016.

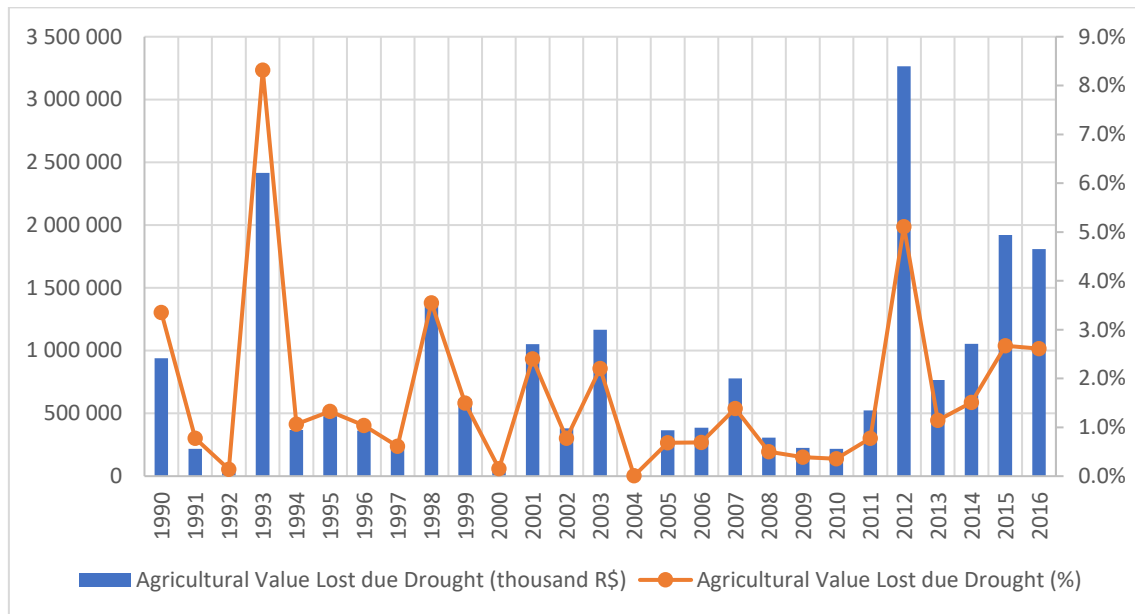


Figure 7 shows the losses in the production value of beans and corn only. The interpretation remains unchanged: the tendency of the curves is similar to the trend of Figure 6, although the percentage losses are much more pronounced.

Figure 7. Bean and corn production value lost due to drought over time, 1990-2016

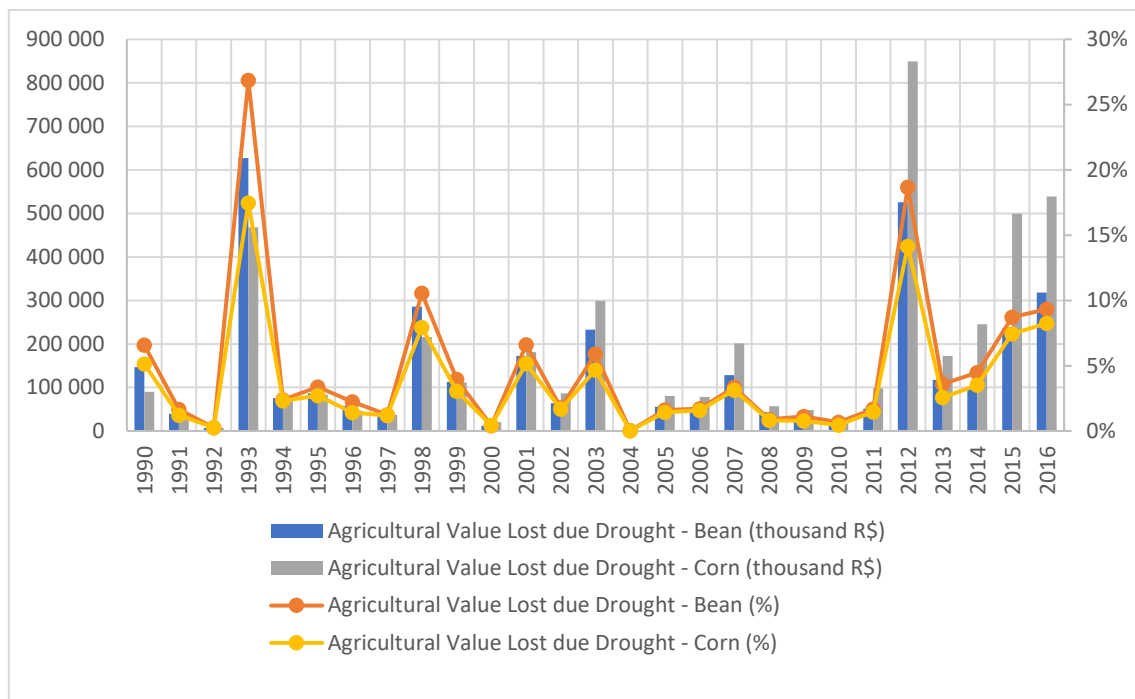


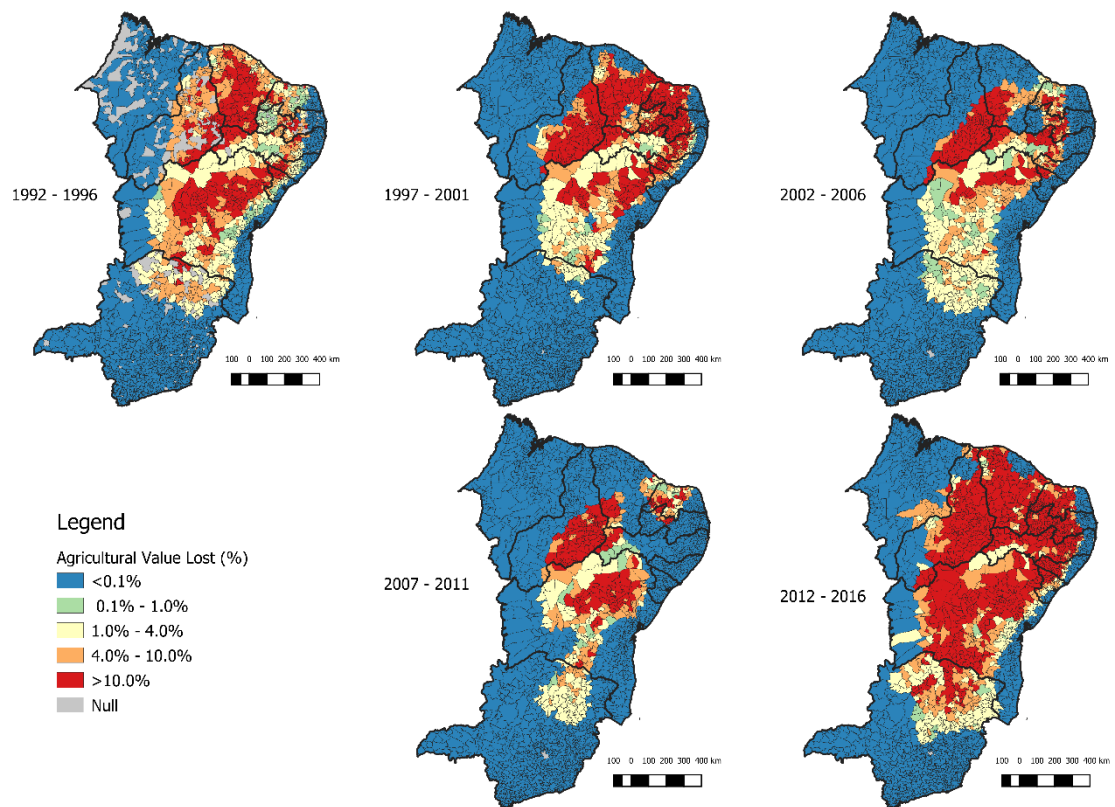
Table 24 shows the averages of the relative losses of the value of agricultural production per decade. It can be seen that, despite the large losses in 1993, the average of the present decade is higher, both for total agricultural production and for mostly family crops. Therefore, it is evident that losses in recent years are more persistent than in the previous years.

Table 24. Average agricultural production value lost due to drought, by decade.

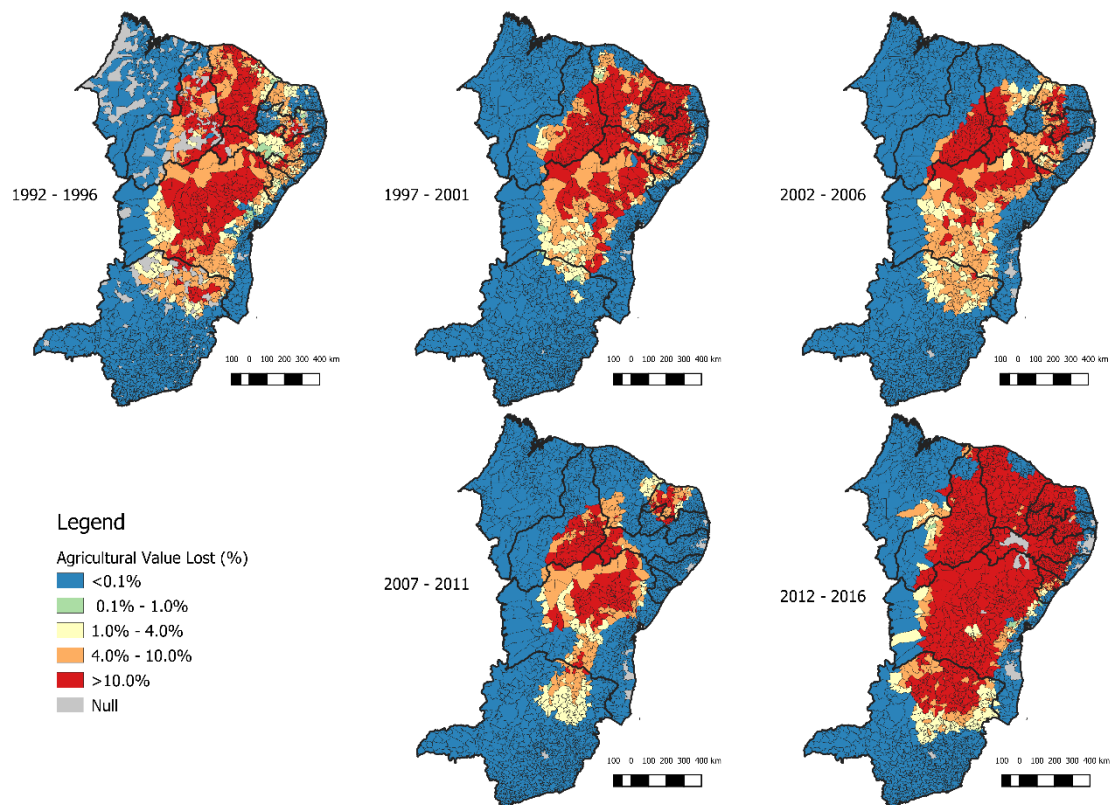
Decade	Lost Value due to Drought - Total agricultural production (% of the total)	Lost Value due Drought - Beans (% of the total)	Lost Value due Drought- Corn (% of the total)
1991-2000	1.8%	5.3%	3.8%
2001-2010	0.9%	2.4%	2.0%
2011-2016	2.3%	7.7%	6.2%

Maps 1 and 2 show the evolution of these losses over time in spatial terms, considering the average loss in agricultural production considering five-year averages.

Map 1. Value of agricultural production lost to all crops



Map 2. Value of lost agricultural production for beans and corn



The results indicate that municipalities in the semi-arid Caatinga suffered much more losses than the rest of Brazilian Northeast and Minas Gerais. Again, they confirm that bean and corn cultivation suffer more than the other crops.

Finally, it is evident that the drought effects since 2012 became much more severe, in accordance to the specialists that are already identifying a change in climate conditions in this region. According to Marengo (2008), the temperature in Brazil increased 0.7°C in the 1958-2007 period, but in the Brazilian Northeast the maximum temperature increased between 1.5 and 2°C in a similar period.

In a more recent paper, Marengo et al. (2017, p. 1196) considered that “regarding the historical simulation, it is possible to identify an increase of temperature from 1901 to 2000 of about 0.8 °C.” They concluded that:

“Future climate projections show temperature increases and rainfall reductions, and the tendency for increases in CDD (a measure of drought) suggests an increase in the tendency for greater frequency/intensity of dry spells and droughts and toward aridification in the region. All these conditions lead to an increase in evaporation in reservoirs and lakes, affecting irrigation and soil moisture and impacting agriculture and population.” (Marengo et al., 2017, p. 1198)

Lacerda et al. (2017) also found an increasing trend in temperature and declining rainfall in a set of cities in the state of Pernambuco:

“The trend analysis of rainfall showed statistically significant negative values for all stations but Vitória and Caruaru, which showed non-significant trend values. The highest rainfall reductions were detected in Petrolina and Recife, with trend values exceeding - 40 mm/decade. The station data trend analyses showed increased maximum temperatures over all stations and decreased rainfall over all stations but Vitória’s. However, the minimum temperature trends showed both positive and negative values.”

According to Cunningham et al. (2017, p.361), this is related to a global trend: “Possibly related to the warming climate, droughts have increased in frequency and intensity over most of the planet in recent decades (Dai et al., 2004; Marengo et al., 2008; Zhou et al., 2011). The percentage of area that was affected by droughts doubled from the 1970s to the early 2000s (Nagarajan, 2009).”

In order to calculate the economic dimension of this problem, the next subsection provides estimates of the losses in agricultural production due to climate change.

4.2. Economic costs of climate change

It is extremely difficult to define in quantitative terms the dimension of economic costs climate change, especially downscaling to the regional level of the Brazilian Semi-Arid. First of all, the literature (Machado Filho et al. 2016, Marengo et al. 2017, among others) there is a considerable uncertainty in the results from the models, since they present wide variation according to the different hypothesis and procedures in which they are based:

“Studies that assess the impacts of climate change, vulnerability and adaptation need a more localised approach (INPE 2015). Nevertheless, despite the improvements since the release of the AR4 in 2007, regional-scale simulations of temperature changes and precipitation patterns are less precise than those on large scales (IPCC 2013).” (Machado Filho et al 2016, p. 3)

Moreover, rainfall in the Brazilian Semi-Arid is known for its wide variability in both spatial and time dimensions (Marengo 2007, p. 1). There is also a problem concerning the lack of information on socioeconomic variables associated with the consequences of droughts. For example, economic data for agriculture is presented in aggregate terms, without much details in terms of the social conditions of the production process.

Nevertheless, there is relatively stable set of papers forecasting future deviations in temperature and precipitation due to climate change (table 23). In general terms, in they range from an increase in temperature between 1.5°C and 4°C, and a reduction in precipitation between 10% and 20% (table 23).

Table 25. Forecasts of climate change in the Brazilian Northeast

Paper	Model	Temperature	Precipitation
Marengo et al. (2007)	HadAM3 B2 "optimistic"	More 1-3°C	Less 10-15% of the average
Marengo et al. (2007)	HadAM3 A2 "pessimistic"	More 2-4°C	Less 15-20% of the average
Lacerda et al. (2015)	Same as Marengo et al. (2007)	More 1-3°C	Less 1-2 mm/day, or 10-15% of the average
Lacerda et al. (2015)	Same as Marengo et al. (2007)	More 2-4°C	Less 2-4 mm/day, or 15-20% of the average
Machado Filho et al. (2016)	RCP4.5	More 0.5–2°C	Less 10-20% of the average
Machado Filho et al. (2016)	RCP8.5	More 0.5–2°C	Less 10-20% of the average, but - 20% is more likely

Considering these forecasts, we projected two alternative scenarios considering precipitation reduction due to climate change: a moderate reduction of 10% ("optimistic"), and a strong reduction in 20% of average precipitation ("pessimistic").

Then, we projected changes in output assuming that *ceteris paribus* all remaining production conditions (productivity, cultivation area, relative prices, etc.) remain the same as in the average of the 1990-2016 period. The annual average lost area for total crops due to droughts in the 1990-2016 period was 221,973 hectares (89,497 hectares for bean and 10,276 for corn). In the scenario of less 10% of precipitation, considering a proportional reduction, the total cultivated area lost because of climate change would be 22,197 hectares (8,950 for bean and 10,276 for corn). This would represent an average annual loss of R\$ 96.7 million in agriculture production value (R\$ 20.8 million for bean and R\$ 22.1 million for corn). In the 20% rainfall reduction scenario, these losses increase to 44,395 hectares (17,899 for bean and 20,552 for corn), and an average annual loss of

R\$ 193.3 million in agriculture production value (R\$ 41.5 million for bean and R\$ 44.1 million for corn).

Table 26. Average lost per year in agricultural production value due to climate change

	Average Lost Area due Drought - 1990-2016 (ha)	Average Lost Area due to Climate Change - 10% (ha)	Average Lost Area due to Climate Change - 20% (ha)	Average Agricultural Value Lost due to Climate Change - 10% (thousand R\$)	Average Agricultural Value Lost due to Climate Change - 20% (thousand R\$)
Bean	89,497	8,950	17,899	20,763	41,526
Corn	102,761	10,276	20,552	22,062	44,124
Total	221,973	22,197	44,395	96,662	193,324

If projected to the 2017-2030 period, *ceteris paribus*, this would represent an accumulated loss between R\$ 1.4 to 2.7 billion (current values), about half of this concentrated in the two crops mostly identified with family agriculture, bean and corn (table 27). If the period is extended to 2017-2050, the accumulated losses increase to R\$ 3.3 to R\$ 6.6 billion (current values).

Table 27. Accumulated loss in agricultural production value due to climate change, 2017-2030 and 2017-2050 periods

	2017-2030		2017-2050	
Crop	Total Agricultural Value Lost due to Climate Change - 10% (thousand R\$)	Total Agricultural Value Lost due to Climate Change - 20% (thousand R\$)	Total Agricultural Value Lost due to Climate Change - 10% (thousand R\$)	Total Agricultural Value Lost due to Climate Change - 20% (thousand R\$)
Bean	290.685	581.371	705.950	1.411.900
Corn	308.867	617.734	750.106	1.500.212
Total	1.353.269	2.706.538	3.286.510	6.573.020

Note these are underestimates of the total costs of climate change, since they do not consider livestock and other agriculture activities. Also, there is an implicit assumption that costs are proportional to the reduction in average rainfall. However, there are possible discontinuities in this relationship, and losses are very likely to be more than proportional to the reduction in rainfall.

5. Conclusion

The results of our statistical analysis considering the effects of droughts, either measured by the occurrence of climatic disasters (droughts and dry spells) or very low levels of precipitation, in the agricultural production (cultivation and livestock) in the Brazilian drylands of the Northeastern Region and Minas Gerais.

We showed that:

- There is a significant correlation between climatic disasters (droughts) X average precipitation, so we can use both as proxies for climate change;
- There is a significant correlation between climatic disasters (droughts) or average precipitation X agricultural production (crops cultivation or livestock, the effect is higher on cultivation);
- There is a significant correlation between climatic disasters (droughts) or average precipitation X agricultural production of specific products related to family/subsistence farming (beans and corn), and this effect is higher than in the average agricultural production.

We considered many different ways of testing the hypothesis that droughts reduce either the productive area and output, and all of them were robust in terms of statistically significant results. However, we believe that the exercises which presented the best fit were based on the use of rainfall categories, rather than the occurrence of extreme drought events. On the other hand, there are pros and cons using the results based on municipalities and micro-regions, and we suggest to present results expressed in both terms.

We projected two alternative scenarios considering precipitation reduction due to climate change: a moderate reduction of 10% ("optimistic"), and a strong reduction in 20% of average precipitation ("pessimistic"). The annual average lost area for total crops due to droughts in the 1990-2016 period was 221,973 hectares (89,497 hectares for bean and 10,276 for corn). In the scenario of less 10% of precipitation, considering a proportional reduction, the total cultivated area lost because of climate change would be 22,197 hectares (8,950 for bean and 10,276 for corn). This would represent an average annual loss of R\$ 96.7 million in agriculture production value (R\$ 20.8 million for bean and R\$ 22.1 million for corn). In the 20% rainfall reduction scenario, these losses increase to 44,395 hectares (17,899 for bean and 20,552 for corn), and an average annual loss of R\$ 193.3 million in agriculture production value (R\$ 41.5 million for bean and R\$ 44.1 million for corn).

Considering the 2017-2030 period, this would represent an accumulated loss between R\$ 1.4 to 2.7 billion, and in the 2017-2050, the accumulated losses increase to R\$ 3.3 to R\$ 6.6 billion.

It is important to highlight that these exercises underestimate the total costs of climate change, since they do not consider livestock and other agriculture activities. Also, there is an implicit assumption that costs are proportional to the reduction in average rainfall. However, there are possible discontinuities in this relationship, and losses are very likely to be more than proportional to the reduction in rainfall.

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Possíveis impactos da mudança de clima no Nordeste. Jose A. Marengo. 2007. Rainfall reduction in the range between 10% and 15%.

Appendix

Table A. I. Number of municipalities in each precipitation category by year, 1981-2016.

Year	Precipitation (1)	Precipitation (2)	Precipitation (3)	Precipitation (4)	Total
1981	517	695	792	92	2,096
1982	523	637	816	120	2,096
1983	678	694	651	79	2,102
1984	613	1,177	315	-	2,105
1985	1,786	320	-	-	2,106
1986	1,101	628	417	-	2,146
1987	875	811	461	-	2,147
1988	884	1,127	135	-	2,146
1989	1,497	682	-	1	2,180
1990	472	1,155	601	-	2,228
1991	1,330	815	83	1	2,229
1992	1,491	726	11	-	2,228
1993	367	880	674	384	2,305
1994	1,210	929	170	-	2,309
1995	1,052	976	282	-	2,310
1996	916	1,188	207	-	2,311
1997	1,079	1,341	214	-	2,634
1998	683	1,117	681	151	2,632
1999	847	1,373	411	1	2,632
2000	1,667	934	28	-	2,629
2001	914	1,148	569	4	2,635
2002	1,170	1,323	141	-	2,634

2003	993	1,035	606	-	2,634
2004	1,565	1,067	2	-	2,634
2005	1,338	1,092	205	-	2,635
2006	1,295	1,228	110	-	2,633
2007	816	1,454	362	-	2,632
2008	1,373	1,183	76	-	2,632
2009	1,742	826	67	-	2,635
2010	1,017	1,454	164	-	2,635
2011	1,685	800	150	1	2,636
2012	615	873	774	375	2,637
2013	1,255	891	490	-	2,636
2014	437	1,682	517	-	2,636
2015	590	1,039	988	15	2,632
2016	815	946	822	52	2,635
Tota l	37,208	36,246	12,992	1,276	87,722

Table A.II. Productive area and lost area due to drought by year, 1990-2016.

Year	Productive Area (ha)	Lost Area due Drought (ha)	Lost Area due Drought (%)
1990	17,574,873	542,312	3.1%
1991	18,097,613	136,071	0.8%
1992	18,130,928	24,086	0.1%
1993	16,004,964	1,140,912	7.1%
1994	18,107,040	185,363	1.0%
1995	17,719,902	229,011	1.3%
1996	14,552,851	146,033	1.0%
1997	15,167,092	90,710	0.6%
1998	14,083,041	453,495	3.2%
1999	14,897,146	206,804	1.4%
2000	15,586,060	23,263	0.1%

2001	15,160,835	335,197	2.2%
2002	15,962,789	117,840	0.7%
2003	16,424,362	347,260	2.1%
2004	17,417,494	1,159	0.0%
2005	17,411,154	116,574	0.7%
2006	17,578,387	116,578	0.7%
2007	17,457,318	235,128	1.3%
2008	18,021,888	86,655	0.5%
2009	17,964,019	67,807	0.4%
2010	17,275,892	59,167	0.3%
2011	18,271,084	138,194	0.8%
2012	17,084,280	800,956	4.7%
2013	16,736,006	182,462	1.1%
2014	17,967,790	260,318	1.4%
2015	17,674,195	450,974	2.6%
2016	17,011,817	415,463	2.4%

Table A.III. Bean and corn productive area and lost area due to drought by year, 1990-2016.

Year	Productive Area - Bean (ha)	Lost Area due Drought - Bean (ha)	Lost Area due Drought - Bean (%)	Productive Area - Corn (ha)	Lost Area due Drought - Corn (ha)	Lost Area due Drought - Corn (%)
1990	2,999,158	165,587	5.5%	4,101,663	182,197	4.4%
1991	3,443,058	54,542	1.6%	4,640,237	53,553	1.2%
1992	3,406,149	8,032	0.2%	4,548,737	10,450	0.2%
1993	2,687,020	507,891	18.9%	3,887,952	510,627	13.1%
1994	3,605,785	81,335	2.3%	5,024,418	108,526	2.2%
1995	3,311,408	107,148	3.2%	4,706,780	123,697	2.6%
1996	2,851,546	60,418	2.1%	3,879,071	52,462	1.4%
1997	2,884,767	34,565	1.2%	3,932,769	45,339	1.2%
1998	2,255,166	183,035	8.1%	3,284,363	220,460	6.7%
1999	2,779,858	92,847	3.3%	3,728,348	99,516	2.7%
2000	2,867,684	11,504	0.4%	3,854,552	16,145	0.4%
2001	2,539,780	139,873	5.5%	3,770,889	166,579	4.4%
2002	2,872,456	48,160	1.7%	3,925,926	60,040	1.5%
2003	2,867,646	153,081	5.3%	4,183,921	178,405	4.3%
2004	2,933,776	692	0.0%	4,281,227	484	0.0%
2005	2,721,467	40,346	1.5%	4,104,175	57,139	1.4%
2006	2,776,063	43,886	1.6%	4,199,226	62,609	1.5%
2007	2,597,872	81,537	3.1%	4,283,178	127,643	3.0%
2008	2,681,862	22,333	0.8%	4,339,924	33,363	0.8%
2009	2,738,344	28,431	1.0%	4,415,170	32,606	0.7%
2010	2,341,601	14,189	0.6%	3,863,533	16,138	0.4%
2011	2,535,372	38,512	1.5%	4,211,980	57,207	1.4%
2012	1,890,351	266,868	14.1%	3,734,783	425,419	11.4%
2013	1,780,029	56,499	3.2%	3,550,285	81,884	2.3%
2014	2,126,658	85,654	4.0%	4,145,317	132,554	3.2%
2015	1,975,571	149,792	7.6%	3,969,420	263,819	6.6%
2016	1,795,881	137,107	7.6%	3,678,403	251,110	6.8%

Table A.IV. Agricultural production value per hectare by year, 1990-2016.

Year	Average Agricultural Value (thousand R\$/hectare)	Average Agricultural Value - Bean (thousand R\$/hectare)	Average Agricultural Value - Corn (thousand R\$/hectare)
1990	1.732	0.887	0.495
1991	1.590	0.722	0.643
1992	1.725	0.838	0.682
1993	2.117	1.234	0.917
1994	1.988	0.922	0.634
1995	2.084	0.807	0.674
1996	2.485	0.959	0.886
1997	2.465	0.963	0.826
1998	3.036	1.560	0.980
1999	2.968	1.216	1.120
2000	2.759	1.048	1.245
2001	3.139	1.232	1.086
2002	3.236	1.320	1.444
2003	3.357	1.521	1.676
2004	3.245	1.054	1.313
2005	3.139	1.372	1.402
2006	3.317	1.239	1.254
2007	3.314	1.574	1.576
2008	3.546	1.922	1.697
2009	3.322	1.082	1.479
2010	3.683	1.526	1.547
2011	3.783	1.319	1.712
2012	4.075	1.970	1.997
2013	4.200	2.073	2.107
2014	4.051	1.142	1.852
2015	4.259	1.574	1.892
2016	4.355	2.320	2.147

Table A.V. Agricultural production value and agricultural value lost due to drought by year, 1990-2016.

Year	Agricultural Production Value (thousand R\$)	Agricultural Value Lost due Drought (thousand R\$)	Agricultural Value Lost due Drought (%)
1990	28,029,820	939,226.44	3.4%
1991	27,979,262	216,375.74	0.8%
1992	29,481,472	41,558.80	0.1%
1993	29,045,514	2,415,216.85	8.3%
1994	34,617,424	368,529.38	1.1%
1995	35,923,337	477,236.36	1.3%
1996	34,973,004	362,903.71	1.0%
1997	36,401,370	223,559.23	0.6%
1998	38,767,027	1,376,960.92	3.6%
1999	40,981,977	613,734.29	1.5%
2000	42,100,879	64,191.09	0.2%
2001	43,860,936	1,052,055.57	2.4%
2002	49,113,476	381,310.29	0.8%
2003	52,801,465	1,165,797.55	2.2%
2004	54,150,259	3,759.37	0.0%
2005	53,306,545	365,981.83	0.7%
2006	55,963,131	386,670.38	0.7%
2007	56,149,641	779,190.84	1.4%
2008	61,582,549	307,310.23	0.5%
2009	57,922,612	225,230.88	0.4%
2010	61,728,666	217,898.36	0.4%
2011	67,134,210	522,734.91	0.8%
2012	63,882,883	3,264,085.01	5.1%
2013	66,924,762	766,262.63	1.1%
2014	69,875,914	1,054,494.72	1.5%
2015	71,901,395	1,920,863.90	2.7%
2016	69,212,324	1,809,210.03	2.6%

Table A.VI. Bean production value and bean production value lost due to drought by year, 1990-2016.

Year	Agricultural Production Value - Bean (thousand R\$)	Agricultural Value Lost due Drought - Bean (thousand R\$)	Agricultural Value Lost due Drought - Bean (%)
1990	2,233,420	146,869	6.6%
1991	2,364,998	39,367	1.7%
1992	2,550,506	6,728	0.3%
1993	2,333,435	626,833	26.9%
1994	3,134,202	74,964	2.4%
1995	2,564,685	86,522	3.4%
1996	2,588,495	57,960	2.2%
1997	2,690,800	33,280	1.2%
1998	2,704,090	285,534	10.6%
1999	2,855,870	112,908	4.0%
2000	2,927,078	12,062	0.4%
2001	2,608,247	172,354	6.6%
2002	3,574,691	63,570	1.8%
2003	3,951,530	232,857	5.9%
2004	2,761,753	730	0.0%
2005	3,470,901	55,360	1.6%
2006	3,195,950	54,356	1.7%
2007	3,839,373	128,365	3.3%
2008	4,831,021	42,921	0.9%
2009	2,782,875	30,768	1.1%
2010	3,247,831	21,656	0.7%
2011	3,048,168	50,814	1.7%
2012	2,817,063	525,722	18.7%
2013	3,252,828	117,102	3.6%
2014	2,189,672	97,794	4.5%
2015	2,702,781	235,845	8.7%
2016	3,412,630	318,089	9.3%

Table A.VII. Corn production value and corn production value lost due to drought by year, 1990-2016.

Year	Agricultural Production Value - Corn (thousand R\$)	Agricultural Value Lost due Drought - Corn (thousand R\$)	Agricultural Value Lost due Drought - Corn (%)
1990	1,756,847	90,171	5.1%
1991	2,834,715	34,414	1.2%
1992	2,793,135	7,126	0.3%
1993	2,682,522	468,457	17.5%
1994	2,975,459	68,805	2.3%
1995	3,068,906	83,433	2.7%
1996	3,289,093	46,474	1.4%
1997	3,141,505	37,435	1.2%
1998	2,724,085	216,048	7.9%
1999	3,655,022	111,486	3.1%
2000	4,675,729	20,095	0.4%
2001	3,504,554	180,925	5.2%
2002	5,143,169	86,696	1.7%
2003	6,388,426	299,038	4.7%
2004	5,215,808	635	0.0%
2005	5,564,965	80,112	1.4%
2006	4,950,555	78,484	1.6%
2007	6,450,733	201,207	3.1%
2008	6,998,273	56,611	0.8%
2009	6,171,373	48,238	0.8%
2010	5,575,929	24,965	0.4%
2011	6,740,110	97,938	1.5%
2012	6,007,091	849,456	14.1%
2013	6,712,824	172,526	2.6%
2014	6,980,796	245,517	3.5%
2015	6,716,446	499,172	7.4%
2016	6,529,842	539,114	8.3%

Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex: Appendix 5. Working Paper Stakeholder Engagement Plan 03 06 2020

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

Planting climate resilience in rural communities of the Northeast Project (PCRP) – 2000002253

19 May 2020

Working Paper. Stakeholder Engagement Plan

1. Introduction

Since its beginning, the design of the Planting Climate Resilience in rural communities of the Northeast Planting Climate Resilience in rural communities of the Northeast Project (PCRP) has been led by IFAD in partnership with several institutions, including the Brazilian Development Bank (BNDES), the Ministry of Social Development (MDS), and the Ministry of the Environment (MMA). The project reflects the contributions of these organizations and incorporates their different socioenvironmental perspectives. The PCRP was also designed to allow active participation of indigenous, governmental and nongovernmental organizations in the implementation process. This stakeholder engagement plan reflects this process of collectively building the project. PCRP's design process already incorporates the views of the public directly and indirectly involved.

The eight states in Brazil's Northeast semiarid region (known as *sertão*) are home to the country's most impoverished population. For the last 25 years, this region has been the focus of IFAD-supported sustainable agricultural development projects. This consideration has implications for setting up the Stakeholder Engagement Plan, as IFAD has been articulating, consolidating and expanding its range of partnerships in the region for a long time. Although the participating states of the project have not yet been chosen, IFAD has invested in building relationships with a wide range of partner institutions in the region, which will certainly facilitate interactions with social stakeholders and provide subsidies for consultations, pacts, and agreements. The trust that IFAD has built with these different social stakeholders over its 25 years of work experience in the region is a springboard that has benefited the design of this project and its network of interinstitutional relations.

Engaging multiple stakeholders (representatives of civil society and regional and national government agencies and institutions) not only ensures the effectiveness, sustainability, and resilience of project activities actions but also provides support for lasting structural and transformative impacts. The formation of management units in institutional arrangements with the participation of a range of social stakeholders is a fundamental step toward fulfilling the following objectives: (i) ensure complementarity between the actions and strengths of partner organizations, aligning strategies and promoting effective collective efforts; (ii) strengthen analytic capacity and seek diverse perspective and approaches to problems affecting agricultural development and environmental sustainability and determine

sound solutions; (iii) increase citizens' political influence, in order to encourage qualified interventions in councils, forums and other political and civic venues; and (iv) enhance effectiveness of use of monetary and non-monetary resources (counterparts) for scaling-up local and regional initiatives.

The project's third component, Knowledge Management and Scaling-up, includes an expanded number of social stakeholders as it provides strategies for consolidation of learning laboratories, exchanges and replication, with a focus on production and dissemination of communication materials. The effort to demonstrate and encourage reproduction of the project's successful experiences through the organization/registering/monitoring of strategies has potential to affect the various types of stakeholders: those directly involved in grassroots activities, those indirectly affected, and finally, those who may be interested in acquiring more knowledge about the project and its purposes and achievements.

Fast efficient production of communication materials that circulate in different media and assist inter-institutional processes is increasingly becoming a way to engage a more significant number of interested actors and enable new forms of engagement. Strategies that encourage the exchange of experiences between different Brazilian states and between countries (south-south cooperation initiatives) will reach more distant stakeholders, who will then become aware of climate-related problems and solutions, and can get actively involved in initiatives to address these issues. Especially among government agencies, private companies and social organizations working in the semiarid region of the Northeast, it is of fundamental importance to disseminate results of biome-adapted social technology experiments. As the visibility of initiatives grows, both the stakeholders directly engaged in implementing actions and those indirectly affected will be encouraged to maximize mitigation /adaptation measures, thus increasing the environmental and social benefits generated.

For this reason, the project provides mechanisms to increase the effectiveness of disseminating information based on impact analysis to facilitate both the scaling-up process as well as engagement of civil society stakeholders and government organizations.

2. Brief summary of previous stakeholder engagement activities

In the second half of 2018, IFAD hired nine consultants with a range of expertise to join the BNDES team to help prepare the project proposal. The preparation process took into consideration situations observed from empirical reality, captured from field visits to communities in the region and through meetings and public consultations with potential stakeholders, both governmental and non-governmental organizations.

During field visits to the semiarid states of Bahia and Pernambuco in October 2018, the team witnessed experiences developed by smallholder farmers, many of which focused on environmental sustainability, such as agroforestry systems. Most of these activities were

developed with support and advice from nongovernmental organizations, such as Centro Sabiá and Caatinga (in the state of Pernambuco), which promote integrated processes in water management, agroecology, food security, and ecosystem conservation. In the innovative dialogue with possible partner organizations, core environmental issues were introduced so they could reflect on the impact of their actions on climate-change adaptation and mitigation processes at the local and regional levels. It was also an essential step for the team of experts, an opportunity to identify gaps in the experiences presented and identify possible weaknesses and risks. During field missions, meetings were held not only with the beneficiaries of socio-environmental activities (construction of technologies for water collection and storage and agroecological practices) but also with potential stakeholders already implementing strategies for preserving ecosystems and natural resources. These engagements were crucial for outlining the project and establishing a network of contacts with stakeholders who could be potential project partners.

In late October 2018, the team held a series of meetings with federal government institutions in Brasília, including the Secretariat of Family Agriculture and Agrarian Development (SEAD); the Ministry of Social Development (MDS); the Ministry of the Environment (MMA); the Secretariat of International Affairs (SAIN); the Ministry of Science, Technology, Innovation and Communications (MCTIC), and the General Coordination of Policies for Women, Youth, Peoples and Traditional Communities (CEGAT). These meetings were crucial to understanding the contributions these actors could make to each project component and its institutional arrangements, and as a basis for construction of a Stakeholder Plan that considers the complementarities in implementation strategies of government and nongovernment organizations.

Two public hearings were also held during this preparatory phase. They were essential steps to restructure some aspects of the project (e.g., intervention strategies, guiding concepts, and the relationship between components) and also to mobilize potential stakeholders around the proposed project. The following is a description of the consultations and their results:

(i) The first public hearing was held in Recife on 18 October 2018 with more than 100 participants from approximately 32 different institutions and organizations. The event focused on the discussion of themes underpinning the project's main purpose and strategies, so that people could contribute to project design and voice their main concerns and considerations. The organizations present were divided into six groups, by topic: (1) Adaptation measures; (2) Mitigation measures; (3) Agroforestry: climate resilient productive systems principles in the Semi-Arid; (4) Youth, traditional communities, and gender; (5) Technical assistance; and (6) Biosaline agriculture. Each group produced a series of propositions from its perspective and presented the issues in the plenary session, generating debates. Some points that crossed all

groups were reported in the final summary, such as the importance of experimentation and of sharing among stakeholders involved to promote the agroecological principles. The topics of political impact and "scaling up" successful experiences were also emphasized. The organizations present at this public hearing included:

Programa Água Doce (PAD) – PB, MG, BA, PE, RN, AL, CE; Cooperativa Agropecuária Familiar de Canudos, Uauá e Curaçá (COOPERCUC); Cáritas Regional CE; Departamento de Gestão Ambiental (DGA/UERN); ASA - Articulação no Semiárido; MMA; Associação da Rede de Mulheres Produtoras do Pajeú; Adessu Baixa Verde; Programa de Aplicação de Tecnologia Apropriada às Comunidades (PATAC); Empresa de Planejamento e Assessoria Técnica Agropecuária (Emplanta) – PI ; Eslar – CE; Delegacia Federal do Desenvolvimento Agrário (DFDA) – PE ; Centro de Pesquisa e Assessoria – ESPLAR; Empresa Brasileira de Pesquisa Agropecuária (Embrapa); Centro Sabiá; Associação Águas do Nordeste (ANE); Serviço de Tecnologia Alternativa (SERTA); SASOP – Serviço de Assessoria a Organizações Populares Rurais (SASOP); COOPTERA - Cooperativa de Trabalho e Prestação de Serviços Técnicos da Reforma Agrária da Paraíba Ltda.; Caatinga; Casa da Mulher do Nordeste; Núcleo Sertão Agroecológico/UNIVASF; Instituto Comradio; Organização Terra Viva; SEMA-BA - Secretaria do Meio Ambiente; Agroflor; AACC-RN - Associação de Apoio às Comunidades do Campo do Rio Grande do Norte; IRPAA - Instituto Regional da Pequena Agropecuária Apropriada; SAF - Secretaria de Agricultura Familiar – Maranhão; IBAMA – Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis; ASPTA – Agricultura Familiar e Agroecologia; Núcleo Jurema – UFRPE/Universidade Federal Rural de Pernambuco; Rede Nacional de Colegiados Territoriais; Associação Cristã de Base (ACB); Projeto Pró-Rural (Banco Mundial); Federação de Trabalhadores e Trabalhadoras Rurais na Agricultura Familiar (FETRAF); Centro de Estudos do Trabalho e Assessoria ao trabalhador (CETRA); Universidade de Brasília (UNB); Emplanta - Empresa de Planejamento e Assessoria Técnica Agropecuária; Diaconia; Núcleo Jurema – Universidade Federal Rural de Pernambuco (UFRPE).

IFAD-supported projects in Brazil (PSA–Bahia, PDHC II–Federal, PROCASE–Paraíba, Paulo Freire–Ceará Project, Dom Távora–Sergipe Project, PVSA–Piauí) were represented. Government agencies (MDA, MMA) and institutions involved in the project design were also present (BNDES / IFAD).

(ii) The second public hearing was with the specific segment that holds the central role in the project: indigenous peoples. It was held on 9 May 2019 in Salvador, with a 110 participants representing the following ethnicities in the states of Bahia: Pataxó, Tubanambá, Pataxó Hãhãhãe, Atikum, Kiriri, Kaimbé, Tapuia, Tumbalá, and Kantaruré. Indigenous rights organizations and institutions that were present included: Articulation of the Indigenous Peoples of Brazil (APIB); Articulation of Indigenous Peoples and Organizations of NE, MG

and ES (Apoime); Indigenous Movement of Bahia (Miba); Indigenous Missionary Council (Cimi); Bahia Indigenous Education Forum (Forumeiba); and the indigenous teachers association of the North and West of Bahia (Apinoba).

This hearing had two objectives: (i) give voice to the specific contributions of indigenous peoples to the project, respecting their specificities; (ii) identify possible risks in the implementation cycle, in terms of the particular needs of indigenous peoples. The hearing was based on the concept of FPIC ("free, prior and informed consent"), which constitutes a mechanism to "guarantee to an affected or traditional community (local communities within the project's area of influence) the right to give their consent or not to projects that may affect their lands, understood as those they habitually occupy or use". This project partners, focused on socioenvironmental sustainability measures to address climate change, understand that indigenous peoples of Brazil contribute significantly and play a crucial role in prevention of deforestation, ecosystem preservation, and efficient management of natural resources in the national territory. At the same time, there are risks in implementation of any project since indigenous villages are governed by other patterns of behavior, interpersonal and power relationships.

Several points raised by participants in the plenary were noteworthy and have been taken into account in the design:

- (i) The importance of valuing specialized modes of production of indigenous peoples: Participants from different tribes spoke of their tradition to produce collectively in a given area. According to an Atikum leader, they "prioritize collective efforts and work because together they produce more." This issue needs to be taken into account in technical assistance services.
- (ii) Productive processes have been directed toward self-consumption, but there is interest in investing more in income-generating initiatives. Participants at this hearing stressed that the notion of environmental preservation is not a hostile position, which comes as a shock to income generation. These are strengths that can be added in work aimed at improving agricultural activities.
- (iii) Indigenous peoples emphasized the importance of "producing without pesticides" and their desire to learn more about ways to "generate income without pesticides."
- (iv) In the case of some peoples, such as Kiriri, there is a concern with monoculture planting (Eucalyptus, for example), which has driven the deforestation process in the area around the villages.
- (v) In terms of possible risks, some representatives warned of the need to consult the cacique (chief) about the project implementation process, due to his position of authority in the indigenous villages. The organizational forms of indigenous peoples should be respected, which entails careful consultation with the cacique and village management bodies such as the "Council" (composed of elders).

- (vi) Regarding the procedures indicated, the representatives pointed out the importance of conducting a "pre-diagnosis" in the areas to be affected in each community.

Bahia, the state in which the hearing was held, became a "sample" of the issues that affect multiple indigenous peoples in their various territories. The proposals raised were incorporated into project design and should inform other inquiries. The plan is to hold further meetings with indigenous peoples in the states that will be chosen to integrate the project during its implementation cycle. One of the purposes of these meetings will be to reach an agreement with such communities, based on the FPIC commitment. It shows a commitment on the part of the executing entities to engage in construction of a space that provides direct interaction with the various segments of the target audience. It is important that the demands of these different social groups be considered at the start of project implementation so that adjustments can be made promptly.

3. Identifying stakeholders

The project categorises "stakeholders" into two sub-groups: (i) stakeholders directly or indirectly affected by the project; and (ii) others (not affected by the project) that can be classified as "broader stakeholders".

In the first category, although it is important to define the roles of each social actor, the distinction between "directly affected actors" and "indirectly affected actors" will be outlined at the beginning of the proposed implementation process. A methodology will be built together with stakeholders who have been identified as possible partners to understand their level of affinity with the project and to build consensus on their degree of participation in planned actions. Two advisory councils will be established in the first year of project implementation, namely: (i) an **Advisory Committee**; and (ii) a management council in each participating state. In these, some stakeholders will engage, according to their alignments, aspects of convergence, and degree of participation in strategies and actions. Selection of the stakeholders that will participate and in which council will be conducted during the first year of project implementation.

Among all stakeholders, the role of the Semiarid Articulation (ASA), a coalition of more than 3,000 civil society organizations organized in forums and networks in 10 states, will be essential, especially in Component 1, due to its long experience in water management (water supply and supply). ASA has played a key role in programs such as the One Million Cisterns Program, which seeks to implement appropriate technologies to collect, store and supply water for human consumption and food production. During the design (involving field visits and meetings with potential stakeholders), there was a rapprochement to the ASA, to get to know more about its experience with water management equipment and technologies as well

as to enquire about the possibility of having its most robust engagement in Component 1. Organizations working with agroecology in Brazil should also be involved, as they can make essential contributions in experimenting with new technologies in biome-adapted agricultural production adapted. As directly affected stakeholders, the following organizations should be active participants: Agroforestry Movement of Syntactic Inclusion (MAIS); Advisory Service to Rural Population Organizations (SASOP); Service of Alternative Technology (SERTA); Regional Institute of Appropriate Small Farming; Family Agriculture and Agroecology (ASPTA); Center for study of work and Advice to the worker (CERTA); Caatinga; and Centro Sabiá.

Ministries at the federal and state levels will play an essential role in project management (incorporated into the managerial units). These include: the Ministry of Science, Technology, Innovation and Communications (MCTIC); the Ministry of the Environment (MMA); Department of Environmental Management (DGA / UERN); the Ministry of Social Development (MDS); and State Coordination of the Água Doce Program.

In the "broader stakeholders" category (stakeholders not likely to be directly involved but who can contribute to research on core activities, if they are aligned with the project guidelines), the role of research institutions and universities will be key. Important stakeholders in this category include: Agroecological Sertão / UNIVASF; Centre of Studies, Research and Agroecological practices in the Semiarid (NEPPAS / UFRPE); Centre of Agroecology and Peasantry (NAC / UFRPE); Centre Sertão Agroecológico / UNIVASF; International Policy Center for Inclusive Growth (IPC / UNDP); Federal University of Viçosa (UFV) and National University of Brasília (UnB).

4. Approaches for socially vulnerable groups

The project follows a targeting strategy that first identifies and prioritizes the most vulnerable groups and then conducts specific activities with these beneficiaries to address and meet their demands and desires.

To incorporate women's needs, gender issues should be integrated into the baseline study, to be implemented in the project's first year, shortly after the beneficiary communities have been selected. A crosscutting treatment of gender is sought, both in the baseline study and in other tools and instruments used throughout the PCRPP implementation cycle. In the project's second year, when the Territorial Resilience Investment Plans (TRIPs) are implemented, a diagnosis to identify the specific circumstances experienced by rural women will be conducted in the context of each community. This diagnosis will be essential for informing the project's following phases, since it will provide subsidies for family productive processes so that women can be protagonists in the creation and innovation of technologies leading to more resilient agricultural systems. From the project's second year on, a series of

activities (training, workshops, case studies, organizing, etc.) aimed at strengthening women in the community and territorial levels.

One of the project's core targets is youth, especially for "Output 7" (Capacity building, social communication, and participation of women, youth and traditional communities). The project design emphasizes social communication activities and knowledge management, and rural youth is understood to be a critical actor in these initiatives, playing a crucial role as "young communicators" in registering, organizing, and providing outreach of activities and innovations.

Two strategic actions will be implemented in the project's first phase to diagnose and give visibility to the specific circumstances of the traditional peoples' needs (indigenous and quilombola communities) in the project area. After the beneficiaries are selected, consultation and engagement with traditional communities must be carried out, including FPIC. The purpose of these activities is to examine feedback on the project (suggestions and proposals) and survey the specific demands of traditional communities in PCRPs's geographical area, aiming at incorporating an ethnic-racial approach to the project, and to obtain consent. The second proposed action is a diagnosis of traditional communities to better understand their sociopolitical reality, relation with natural resources, socioenvironmental and cultural practices. This information should support the Technical Assistance (ATER) teams in their direct action in such communities, assisting technicians in construction of approaches that take into account the specific circumstances of these social groups.

In the consultation and engagement process, it is crucial to ensure measures that facilitate indigenous peoples' participation, namely:

- (i) Choose accessible places for meetings, at local or municipal levels, to facilitate participation;
- (ii) Schedule the meetings at appropriate times so women can attend, and create mechanisms that ensure child care;
- (iii) Provide meetings with a small number of participants, so that everybody has the opportunity to express their views and issues. In the case of larger groups, methods that encourage active participation should be used, such as splitting participants into smaller groups for brainstorming and then providing opportunity for all groups to present their main ideas in the plenary session.

The consultations will be valuable opportunities to fine-tune project design and operation, according to demands made by the indigenous and quilombola communities. Changes will not be structural, in the sense of altering the project's objectives and grand strategies, but considerations expressed by local communities must be taken into account. The diagnosis will generate information about the specific situation of traditional communities in the beneficiary area and provide a basis for directing intervention strategies according to their specific needs. In the process of selecting families to receive benefit of investments, the

issue of access to land must be considered, since it is a key issue for traditional communities. The technical team that will work in these communities should seek measures to support recognition of traditional communities' lands with the Palmares Foundation and to obtain the Rural Environmental Registry (CAR); thus, respecting the particular manner in which they handle land and natural resources.

There will be an emphasis on production of media materials that highlight the issues facing the most vulnerable groups. Progress reports and case studies are expected to incorporate a gender, race and ethnic perspective. The project will also undertake at least four case studies to examine experiences of traditional communities with TRIPs.

Throughout project execution, some actions (listed below, by output number) will include the specific interests of traditional communities (quilombolas and indigenous peoples):

(a) OUTPUT 1. Territorial resilience investment plans (TRIPs): Years 1–2

- Baseline: In the baseline planning process, an effort will be made to incorporate the specific issues experienced by particular stakeholders (such as traditional communities, young people, and women).
- Consultations and engagement with indigenous peoples and quilombola communities: These are among the first priority actions to be carried out by the project, so stakeholders can propose suggestions about the project's operation and a survey of specific demands and needs of traditional communities can be compiled. FPIC is included.

(b) OUTPUT 3. Collective resilient investments: Years 2–6

- Diagnosis: At this stage, the specific needs and demands of traditional peoples and women (including their relation to natural resources) will be addressed. As previously mentioned, it will serve as a basis for methodological approaches explicitly targeting traditional peoples and will be incorporated into the training of the technical assistance team.
- Training the technical assistance team: Activity designed for the project's second year: prepare team for interventions in indigenous and quilombola communities and to deal with other target groups such as rural women.

(c) OUTPUT 6. Capacity and awareness building: Years 1–6

- Periodic training, workshops and meetings with rural women;

- Child-care services, in order to foster care and greater participation of women in scheduled activities;
- Registration and organization of initiatives to test adapted technologies led by women and young people;
- Workshops in social communication techniques and approaches and inter-regional and inter-state exchanges for young communicators.

(d) OUTPUT 7. Scaling-up and sharing: Years 1–8

- Create and implement a methodological approach to support learning and experience sharing within Brazil and also at the international level, highlighting participation of women, youth and traditional communities as knowledge managers and disseminators of innovative practices.
- Produce thematic studies and publications, focusing on initiatives led by women, youth and traditional communities in construction of resilient and sustainable productive systems.
- Disseminate gender-focused proposals aimed at fostering greater resilience to climate change through various types of media.

(e) OUTPUT 8. Planning, Knowledge Management and M&E: Years 1–8

- Construct a monitoring system with data disaggregated data by gender and define progress indicators that incorporate the focus on racial and ethnic factors.
- Promote local meetings to evaluate project results encompassing at least four indicators and focusing on gender, race and ethnicity.
- Seminars with representatives of community leaders (40% should be women) at the beginning, middle and end of the project implementation cycle to assess impact.

5. Stakeholder engagement program

5.1 Social control mechanisms during project implementation

Project mechanisms must be created to ensure not only the engagement of stakeholders in the proposed strategies and actions but also the promotion of forms of social regulation and monitoring of PCRPs' operational process. The first step for implementing social control processes is establishment of management bodies that incorporate multiple stakeholders at both the CPMU and Project Management Unit (PMU) levels. In the federal context, an advisory committee will be set up with participation of representatives from governmental agencies and ministries to ensure the effectiveness of actions and integration

of the project with other initiatives, programs, and policies. At the PMU level, management councils will be created to ensure that the objectives and strategies will be met, and also to incorporate principles of transparency and equity, with participation of the beneficiaries, state secretaries and representatives from civil society partner organizations.

During this phase, it is fundamental to have clarity about the objectives and approaches of these two bodies; otherwise it would be a challenge to implement an effective social control action plan. In the two bodies, stakeholders' roles vary depending on their profiles, capacities, and skills. They will play a significant role in the proposed institutional arrangements, so their functions must be predefined with respect to other internal units, to foster possibilities for relations between organizational structures. Selection criteria for appointing stakeholders to management councils must be established in such a way that the most vulnerable groups (such as indigenous peoples) are represented.

These two bodies will ensure the systematic scheduling of evaluation and monitoring meetings on the project's strategies and actions carried out over the six years of PCRPP implementation, and they will also be committed to and engaged in the mid-term evaluation. This process will be conducted by external evaluators, but its inputs must support a process of critical analysis of the practices lived by the stakeholders engaged in these management bodies.

In these assessments, stakeholders will also make periodic evaluations based on potential social and environmental risks. The evaluations will be based on risks identified in the SECAP and will incorporate proposals on strategies to overcome the risks.

5.2 IFAD's grievance and redress mechanism (GRM)

A mechanism for channeling grievances and concerns of the various stakeholders will be implemented in PCRPP to support conflict resolution and to build good relationships among stakeholders, teams and management. The CPMU and PMUs cannot resolve complaints related to the project. Periodic meetings with stakeholders during project execution (every six months) will be an excellent opportunity to collect feedback and solve interinstitutional conflicts. It will also be essential to create specific GRM strategies for the most vulnerable stakeholders. It is recommended that meetings with these social groups (traditional communities and women) be held for taking their feedback or difficulties into consideration, and for proposing collective solutions. These meetings will be conducted in such a way that participants feel free to voice their issues without fear of retaliation.

M&E technicians will be responsible for documenting the feedback received and how they are addressed, including the process' outcome and its implications. For formal complaints, CPMU and PMUs will respond and prepare summary of each process for the project advisory bodies (advisory committee and management council), and for sharing and

publicizing information with the general public. Opportunities will be created to periodically disseminate abstracts among stakeholders and the general public on the results of the processes addressed in the GRM. If the project agencies do not adequately respond, then the matter may be brought to the attention of IFAD. The issue may be brought straight to IFAD if the complainants feel they might be subject to retaliation if they went to the Lead Agency directly.

5.3 Action Plan: planned activities and budget

Activities in this Action Plan that directly involve stakeholders include:

1. Consultations with traditional communities on PCRCP's strategies and actions to ensure FPIC and to gather suggestions and proposals;
2. Analysis with stakeholders considered socially vulnerable (women and traditional communities) to understand their specific circumstances and concerns related to socioenvironmental practices and traditions;
3. Periodic meetings with stakeholders to evaluate project actions, open communication on any complaints about the operation, and suggest modifications and adaptations;
4. Regular meetings of advisory bodies involving several stakeholders: advisory committee and management council;
5. Territorial meetings with stakeholders acting at local and regional levels in the scope of the project to evaluate the M&E processes of the strategies and actions;
6. Design and conduct baseline study; results will be shared with stakeholders;
7. Impact evaluations: review studies presented to key stakeholders;
8. Sharing exchanges and other South-South events in Brazil and abroad directly involving the most vulnerable stakeholders (representatives of traditional communities, women, and young people).
9. Workshops, training, and exchanges that foster learning about sustainable and resilient practices, for young people, women, and traditional communities;
10. Train TA team on ethnicity/race/gender perspectives to integrate into the approaches and methodologies applied in traditional communities;
11. Organize and register case studies on initiatives carried out by the most vulnerable stakeholders (women and traditional communities).

Costs of these activities are already included in the project budget (most fall under Component 3).

5.4 Timeline

(*Note: the number of “x” refers to the activity's frequency)

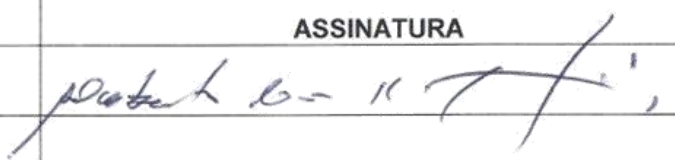
ACTIVITY	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Consulting traditional communities for FPIC	x							
Implement baseline study and share results with stakeholders	x	x	x					
Analyze most vulnerable stakeholders' socio-environmental practices and traditions	x							
Training technical assistance teams on the specific factors of vulnerable stakeholders		x	x	x				
Promote meetings of management bodies	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Promote evaluation meetings with stakeholders (some focus on GRM)	xx	xx	xx	xx	xx	xx	xx	xx
Promote territorial M&E meetings with stakeholders	x	x	x	x	x	x	x	x
Share impact evaluation with critical stakeholders				x			x	
Implement educational activities on sustainable and resilient practices with youth, women, and traditional communities		xxxx xx	xxxx xxxx	xxxx xxxx	xxxx xxxx	xxxx xxxx	xxxx xxxx	
South-South events including most vulnerable stakeholders				x	x	x	x	
Organize / register case studies of initiatives carried out by vulnerable stakeholders				x	x	x		

APPENDIX I

PUBLIC CONSULTATION PARTICIPATION LIST

18 October 2018

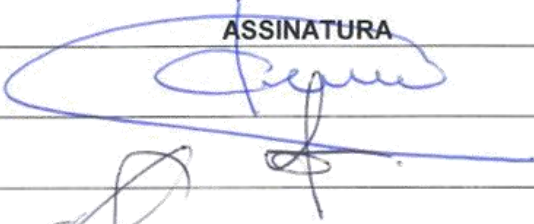
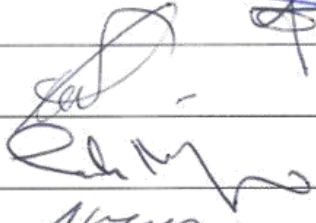
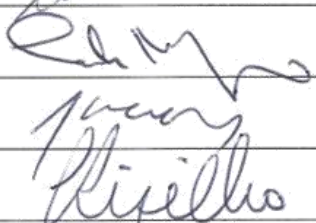
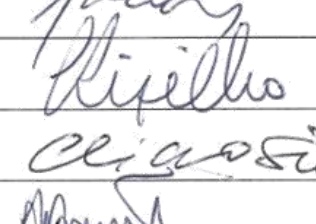
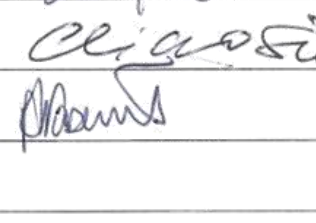
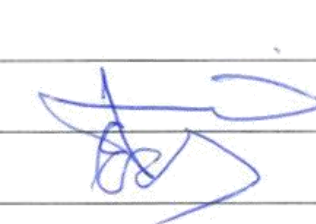
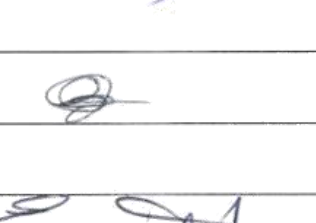
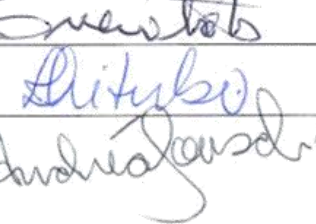


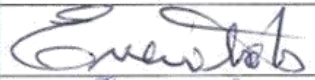
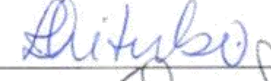
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22	Carlos Martins	Programa Água Doce	
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42	Germano Barros (SERTA)	SERTA	<i>Germano de Barros</i>
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50	Henrique Sousa	FIDA	
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Francisco Camello

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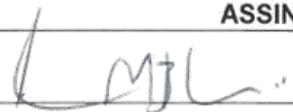


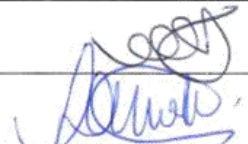





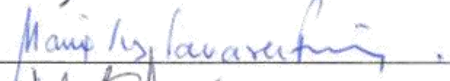

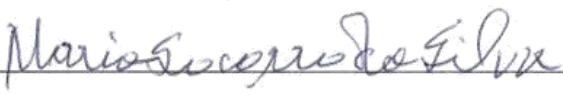
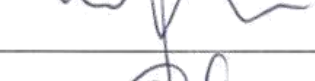



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60	João Ribeiro da Silva	Agroflor	João Ribeiro da Silva Filho
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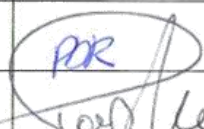

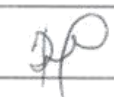

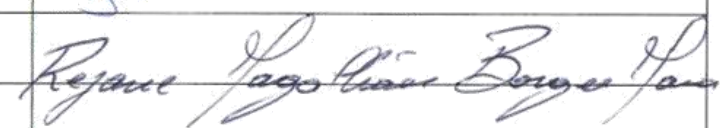
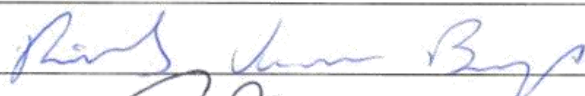
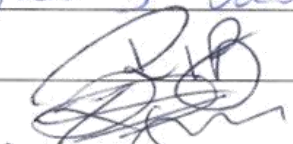
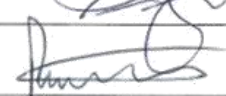

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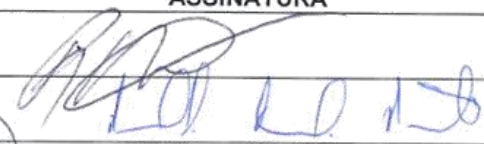
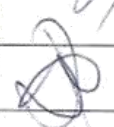

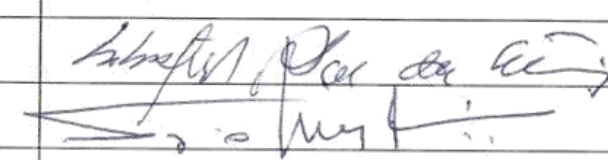
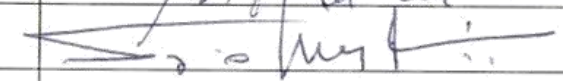
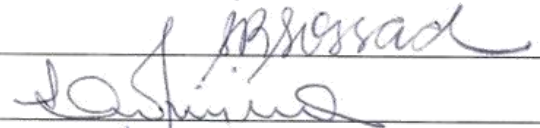
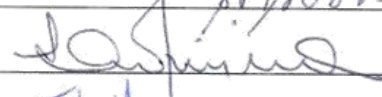
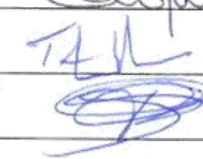

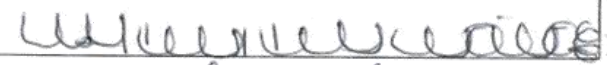
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APPENDIX II

Civil society consultation in Recife: pictures













APPENDIX III

Indigenous consultation in Salvador: pictures











Brazil

Planting climate resilience in rural communities of the Northeast Project Project Design Report

Annex: Appendix 6. Working Paper Covid Mitigation Strategy 22 05 2020

Mission Dates: 9/3/2020 - 13/3/2020
Document Date: 07/10/2020
Project No. 2000002253
Report No. 5402-BR

Latin America and the Caribbean
Programme Management Department

Planting climate resilience in rural communities of the Northeast Project (PCRP) – 2000002253

19 May 2020

Working Paper. COVID19 mitigation strategy for PCRP design and start-up

Situation analysis

As of 19 May 2020, 254,220 COVID19 cases have been confirmed in Brazil, causing 16,792 deaths. Many Northeast state governments have introduced lockdown or partial lockdown and social distancing measures, thus greatly restricting mobility. Ceará and Pernambuco are among the hardest hit by the pandemic in Brazil. Infections are reported mainly in urban centres, but also reach rural areas, including IFAD project beneficiaries.

IFAD introduced teleworking for its Brazil staff on 18 March, and by the time of producing this report, five missions have been conducted virtually in the country: the PCRP final design, three implementation support missions and one partial project closure mission. One virtual supervision mission is confirmed for the first two weeks of June, thus consolidating virtual missions in the IFAD operations in the country.

Design process

Virtual design

The final design main mission was scheduled from 9 to 20 March 2020 in Salvador, Bahia, including field visits. Before the mission started, it had to be downsized as the two Rome-based team members were not allowed to travel, which resulted in the mission starting on 9 March with only part of the team (the Brazil-based team members and the PTL who travelled from Panama City with IFAD authorization). As a result, the mission had to be reconfigured with videoconference meetings with the Rome-based mission members. The BNDES participants joined the mission in the first week. In the middle of the mission, on 13 March, by which the COVID-19 situation had badly deteriorated, the mission was curtailed by all mission members travelling back to home base and completing the assignment from there. The mission was thus completed entirely by virtual means. Regardless of the situation, it was possible to keep all deadlines and comply with the delivery of documentation for the PDR. Thanks to the PDT members' flexibility and team spirit, the team adjusted quickly to the new scenario.

Key meetings were successfully held through videoconferencing, Skype for business and Zoom. Some individual meetings were held on WhatsApp and mobile phone calls. All documentation and sharing of information was done firstly by email exchanges of preliminary drafts. Then the documentation was consolidated and posted on Google drive, which allowed PDT members to work on the same document at the same time while tracking changes. One offline version was shared with BNDES, which provided revisions that were then discussed and incorporated in the final document. After a draft version was finalized, the document was consolidated by simultaneous fine-tuning on IFADBox, including appendixes and final revisions. The final version was posted on IFADBox and cleared by the LAC front office. The document was then uploaded to ORMS online, where it was finalized.

It is planned to make the final document available in Portuguese. For this, the translation will be arranged by the country office once the PDR preparation is completed.

Risks for design in the COVID context

As the GCF Funding Proposal (FP) had to be prepared prior to the PDR, and to comply with time consuming processes in BNDES, the federal government and GCF, the PDR has benefited from earlier design and consultation stages. In particular, prior work for the FP had already included information collection and stakeholder consultations. As such, the COVID-19 crisis has not impacted severely on the design process.

The PDR preparation took into account the FP preparation, which had the following timeline:

- Field mission in Bahia State: 1 to 5 October 2018;
- Field Mission in Pernambuco State: 15 to 17 October 2018;
- Public hearing in Recife, Pernambuco: 18 October 2018 (more than 120 participants);
- Main mission in Brasilia: 19 to 26 October 2018;
- BNDES HQ design mission: 18 to 22 February 2019;
- Indigenous groups consultation: 8 June 2019.

The field missions in Bahia and Pernambuco states, prepared in collaboration with many partners, have allowed the design team to study and analyse technologies, technical assistance processes, experiences and innovations, specific demand and conditions of the semiarid region, organizational and community-based structures, and institutional arrangements, while taking stock of social, environmental, economic and environmental risks. Meetings with staff of IFAD-financed projects in Bahia (Pro-semiarid) and Paraiba (PROCASE) were also held in July 2018, and a field visit to an agroforestry site (Fazenda Ouro Fino in Bahia) was organised in August 2018.

In addition, various videoconferences were held with BNDES staff as well as meetings with representatives from the National Designated Authority (NDA) at the Ministry of Economy. The consultation at the federal level also included other key Ministries: Citizenship; Environment; Science and Technology; Agriculture, Livestock and Food Supply; Home Affairs, and Foreign Relations.

In February and October 2019, IFAD visited BNDES HQ in order to align the preparation of the project. BNDES in turn visited the IFAD offices in Brasilia and Salvador, and also participated in IFAD supervision mission of the Pro-semiarid Project in October 2019 to familiarize its staff with IFAD procedures.

The IFAD Brazil team also prepared a regional grant project, the Dryland Adaptation Knowledge Initiative (DAKI), which was approved by IFAD in December 2019. This project, which will be implemented in Argentina, El Salvador and Brazil, is due to start in June 2020 and will pave the way for the PCRP and other semi-arid climate change projects by building the capacity of extension workers.

Government situation during the pandemic

The federal government continues its strong support for the PCR. The project has been approved by COFIDE, which entails its entry in the official pipeline of the federal government with fiscal space assigned to it. In addition, with its solid fiscal capacity, BNDES has closely participated with IFAD as integral part in the design process. Subsequent to the ORMS uploading, IFAD continues to have regular meetings with the BNDES team.

The interest of state governments remains solid, with all nine states of Northeast Brazil having expressed strong interest in the project. IFAD continues its strong dialogue with states through bilateral means and through the Forum of State Secretaries of Northeast Brazil and the Governors' Consortium of Northeast Brazil. The latter visited IFAD HQ in November 2019 with of eight Governors, underlining the strategic importance of the PCR and the interest in the IFAD partnership.

PCR Start-up

The project is designed for a long lifespan (8 years) because the first year will be mostly taken up by setting up its implementation structure. It requires: a) Brazilian states to apply for project funding and receive approval of the sub-loans, b) setting up state-level PMUs, and c) subcontracting technical services. These activities will occur during year 1. Hence, no field activities are envisaged until early 2022.

With the state start-up workshops anticipated in December 2021 and field activities commencing in early 2022, it is difficult at this stage to anticipate the future situation concerning COVID-19. However, it is probable that a vaccine or treatment will have been developed, that a large part of the population will have developed immunity or that other measures will be in place by the time the project starts.

Nonetheless, precaution is necessary as it is likely that rural areas will be badly affected by the virus, also by virtue of the vulnerability due to the high poverty rates. This means preparation is essential for the PCR start-up.

In this line, IFAD in Brazil is developing measures that could be adopted and incorporated in the PCR operations. They include the following:

- a) Food and seeds distribution in Paraíba's PROCASE project as emergency reaction to the COVID-19;
- b) Partnership with the State School of Public Health (ESP-CE) to measure indicators on health of beneficiaries so that data and information is available to assist projects in future interventions. This is currently under implementation in Ceará's PPF;
- c) Collaboration with the National Rural Extension Agency (ANATER) on virtual rural extension services through the federal project PDHC II. This experience will be critical as rural extension is central to the PCR;
- d) Partnership with the Gastronomy School of Ceará (EGS) to develop ToT in nutrition, food safety and sanitation with the aim of training at least 130 technical assistance experts and further disseminate the material. This will be done in partnership with FAO;
- e) Conducting telephone surveys on project results in the project in Bahia and Ceará, which could be important to avoid possible delays for the PCR baseline survey;
- f) Collaboration with the COVID RADAR initiative of the Global Compact (UNGC) to the wholesale marketing by organisations participating in IFAD projects in Brazil.

The above will be important in order to prepare and equip the PCRCP to be ready for its start-up. In addition, the DAKI grant due to start in June 2020 will also pave the way to enhance the implementation readiness for 2021. DAKI implementation will include COVID mitigation activities in its workplan.

Specific COVID-19 Measures for PCRCP

As the PCRCP will be implemented in remote and poor rural areas, it is probable that COVID-19 will continue to be a risk at the time of field implementation. As a result, four main courses of action are envisaged:

- a) Strict behavioural protocols will be put in place for project staff and partners, including assessments of when and where field trips are advisable, development of testing and tracing procedures, social distancing measures, avoidance of large gatherings, usage of masks, hand washing and hygienic practices, self-reporting of symptoms and so forth. These protocols will be developed specifically for the PCRCP, possible on the basis of recommendations that IFAD will have put in place by this time for its portfolio;
- b) Deployment of virtual tools and mechanisms for TA and farmer-to-farmer support. While a project of this nature will require physical interaction at the farm and community level, ICT will be utilized to the extent possible in the provision of services. The project already envisions the usage of technologies such as WhatsApp groups and remote TA support. The balance between in-person support and remote assistance will be continuously assessed in response to the context specific COVID-19 situation.
- c) The PCRCP technical assistance (TA) providers will be trained to deliver basic capacity building on public health, nutrition and behavioural change, and may provide necessities (masks, soap and alcohol gel). The feasibility of behavioural changes is context specific, and adequate training of field staff can equip them to assess local situations and provide recommendations (such as distancing and time allocations for common water access, markets, etc.); and
- d) Liaise with state health departments/ secretariats to assess whether the PCRCP can partner with them to deliver health services. Depending on the context, the project may be reaching communities that are not accessed by others, and hence it could assist in multiple ways (e.g., transporting health staff, providing basic inputs, disseminating crowdsourced tracing app usage, etc).

In general, if the PCRCP collaborates by promoting behavioural change and basic public health knowledge and inputs, it can be a strong agent to reduce the impact of the pandemic. The Project TA teams provision of assistance to remote rural communities can be a valuable contribution to disseminating and implementing community health measures, if managed well and in line with strict protocols.

By design, the PCRCP is fully focused on increasing resilience, which is also applicable to the pandemic. It prepares vulnerable communities to face unexpected shocks such as the current crisis. The implementation of project activities will allow communities to be more self-reliant, enabling them to produce their own food, manage their own water usage, and have the tools and knowledge to cope with a possible decline in income without relying entirely on government support. As a result, the project also strengthens communities for crises such as the COVID-19 pandemic.